

**PARRY'S QUARRY, ALLTAMI, MOLD
ENVIRONMENTAL STATEMENT FOR LANDFILL OPERATIONS**

VOLUME I



Submitted to:
Robin Jones and Sons Ltd

Submitted by:
AMEC Earth & Environmental UK Ltd

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AMEC Earth and Environmental. UK
Pistyll Farm, Village Road, Mold, Flintshire, CH7 4EW
Tel: 01352 751 761; Fax 01352 751 451

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NON-TECHNICAL SUMMARY

Introduction

Robin Jones and Sons Ltd, a civil engineering company headquartered in Llandudno, North Wales is seeking planning consent for the construction and operation of a solid waste landfill facility. The proposed facility will be located at Parry's Quarry which lies some 1km north east of the village of Alltami in Flintshire, North East Wales (National Grid Reference SJ 2755 6652).

The site is currently worked by Robin Jones and Sons Ltd for the quarrying of materials which are used predominantly for civil engineering purposes. Quarrying will continue in parallel with the proposed landfill operations.

This Non-Technical Summary accompanies an Environmental Statement (ES) document which represents the product of an Environmental Impact Assessment (EIA) carried out to identify, assess and, where necessary, mitigate the environmental impacts associated with the construction and operation of the proposed landfill. The EIA and associated ES have been prepared by Amec Earth and Environmental with specialist contributions as follows;

TACP	Assessment of Compliance with Policies and Plans
Planit EDC	Landscape and Visual impact Assessment
Veryards Opus Ltd	Traffic and Access

Need for the project

There is a pressing need for further landfill void space within Flintshire as the A D Waste site at Brookhill is due to close in mid 2007. Beyond this time, Flintshire County Council has no provision, at least in the short term, for the disposal of municipal solid waste within the County. Furthermore, there will be a need for disposal capacity for non-hazardous commercial and industrial waste from private sources located within Flintshire for the foreseeable future.

Outline project design

The landfill will provide approximately 2,600,000 million cubic metres of capacity for waste disposal. It is intended that the site will receive municipal solid waste (principally from within the Flintshire area) together with non-hazardous commercial and industrial waste. Waste will be deposited into the quarry void and also placed above existing ground level to form a final domed landform which reaches a maximum of 129m Above Ordnance Datum (AOD).

It is anticipated that the site will receive waste for a period of approximately 15 years. Assuming that site preparation and construction works are completed in 12 months, the overall project lifetime will be approximately 16 years. This timeframe is dependent upon the rate at which waste is disposed at the site and a conservative input estimate of 100,000 tonnes of waste per year has been assumed. In reality, waste input rates could be higher than this thus reducing the project life. Note that for the assessment of traffic

impacts, a worst case position has been applied with respect to development related traffic volume by assuming an annual input rate of 150,000 tonnes.

Careful consideration has been given to the design of the proposed landfill to ensure that the environmental impacts associated with the construction and operation of the facility are minimised. The positioning of the landfill within the site ensures the retention of the vast majority of the existing vegetation which provides effective visual screening around the eastern and western boundaries of the site in particular.

The planning application is supported by a separate Design Statement prepared by Amec Earth and Environmental which provides a thorough description and justification for the proposed design.

The area enclosed within the planning application boundary is approximately 16.3 hectares and the footprint of the landfill itself will occupy some 10 hectares. With the exception of a small area required for access and highway improvement works, the entire planning boundary falls within land under the ownership of Robin Jones and Sons Ltd. Note that the entire area to be occupied by landfilling operations has already been disturbed and degraded by quarrying.

The landfill footprint will be surrounded by a minimum 30 metre buffer zone on all sides relative to the ownership boundary in order to provide appropriate separation of landfilling activities from existing surrounding land uses.

No part of the landfill operations will extend into the Site of Special Scientific Interest (SSSI) which forms part of the Buckley Clay Pits and Commons SSSI and part of the Deeside and Buckley Newt Sites SAC. The SSSI lies to the south of the planning application boundary and supports a population of Great Crested Newt and is protected from existing quarrying operations and will be protected from future landfilling operations by a permanent newt enclosure fence.

The site will be filled and restored in stages. Four cells will be prepared to receive waste and these will each be lined with clay and a geomembrane to ensure the containment of landfill gas and leachate generated from the deposited wastes. Dewatering at the base of the landfill void will be required prior to liner placement and in the early stages of landfilling to enable construction works to proceed and to ensure that the site is not subject to basal heave resulting from groundwater pressure. Dewatering water will be discharged under consent via a dewatering lagoon into Alltami Brook in the same way that dewatering water for existing quarrying operations is managed.

Each cell will first be filled to the level of the existing ground around the edge of the quarry void and then sequentially to the final height. Waste in each cell will ultimately be capped with low permeability soils and then restored in a phased manner as soon as the final capping has been placed. Each cell will receive waste for some 20 months below grade and 20 months above grade. The sequence of cell filling and restoration has been designed to ensure that visual impact of the site for receptors to the north of the site is minimised.

The site will be restored to provide new woodland, grassland and wildflower meadow habitats and the site is intended for public amenity open space post closure.

Landfill gas will be collected in an enclosed collection system from the deposited waste and then either flared or utilised for energy generation depending on gas quality and quantity. Leachate will be gathered via a leachate collection system at the base of the landfill and discharged to foul sewer under consent from Welsh Water.

Should planning consent be secured, then an IPPC permit application to the Environment Agency will be made to operate the landfill. During the application phase of the detailed design of the site will be developed. Only when the Environment Agency provides a permit for operation will construction works on the landfill commence.

Findings of the Environmental Impact Assessment

An EIA was carried out to identify any environmental impacts of the proposals and whether there was any requirement the requirement for mitigation measures to effectively manage those impacts identified as being of significance.

Policies and Plans

The work undertaken by TACP was carried out in accordance with Highways Agency's WebTAG criteria.

Their assessment has demonstrated that the landfill proposals are in accordance with relevant planning policy objectives and that with respect to most of these objectives the project would be clearly beneficial. At worst the project would have a neutral impact upon planning policy objectives which relate primarily to very limited losses of existing vegetation adjacent to the site entrance. These impacts will be mitigated by the proposed restoration and aftercare programme. Furthermore, the proposals to extend the existing SSSI and then create new habitat within the context of the restoration of the site results in a beneficial impact upon policy objectives and plans relating to nature conservation.

The site has been included in the Areas of Search for new waste management sites undertaken by Flintshire County Council and has recently been accepted by the County as a potential site for a new landfill facility. A Strategic Environmental Assessment and Sustainability Appraisal conducted by Hyder on behalf of the Council has confirmed the status of Parry's Quarry in this context providing particular attention is paid to the potential impacts of the use of the site for waste management purposes upon the SSSI/SAC. The Hyder study identified that the site benefits particularly from its close proximity to major transport routes and from the fact that it is relatively remote from residential areas.

Landscape and Visual Impact

With respect to landscape and visual impact, Planit EDC has undertaken an assessment in accordance with the Guidelines for Landscape & Visual Impact Assessment, 2nd Edition, 2002.

Planit EDC has determined that the site is very well screened by existing tree belts lining most of the site perimeter. The close views into the site from the industrial premises to

the north will be mitigated by the construction of a 4m high close boarded timber fence which will be constructed along the northern boundary of the site prior to the commencement of landfilling.

The assessment identified that significant views of the landfill development will be seen from elevated areas, principally Northop Hall to the north west of the site and from the edge of Ewloe Hall to the south east. Distant views (7-8 km away) can be gained from the higher ground to the south and west but from these points the impact of the development will be negligible.

As with the current quarrying operations, the landfill site will be visible from Northop Hall. During the operational phase of the landfilling the exposed faces of the landfill, when they extend above existing ground level around the edge of the quarry void, will appear more prominent than the existing quarry faces. This will be partially mitigated by the progressive restoration of the landfill and the adverse impacts prior to site restoration will be minor. The final restoration will have a moderately beneficial impact on the view from Northop Hall.

The landfill will become visible from the edge of Ewloe Hall when waste placement during the later phases of landfilling extends above the existing tree line. This will have a minor adverse impact upon the quality of the view but this will be temporary in nature.

The existing tree belts around the perimeter of the site will be retained with the exception of a small loss adjacent to the site entrance onto Pinfold Lane. The indicative restoration proposals include significant additional tree planting which shall greatly increase the tree cover on the site. The final landform of the site after landfilling and restoration will be in the form of a rounded hill that is sympathetic to the wider undulating landscape. Local landscape character will not be affected.

The restored site has the potential to contribute significantly to local amenity through allowing public access and the creation of a footpath network on the site.

Hydrology and Hydrogeology

The proposed landfill site is situated within a geological setting that is suitable for a landfill project. Extensive studies have been undertaken to examine the geological and hydrogeological conditions which prevail at the site in order to allow a robust assessment of impacts upon the groundwater and surface water environments to be made.

The site is within an area designated as Minor Aquifer by the Environment Agency and there are no groundwater abstractions in the locality of the site.

The site lies within the catchment of the River Dee which is situated approximately 3.5 km to the north-east. The nearest watercourse to the site is Alltami Brook which flows around the west of the site and then approaches to within 250 m of the northern site boundary. Alltami Brook converges with Wepre Brook 900 m to the north-east of the site, which then flows eastwards and north-eastwards to the River Dee about 4 km north-east of the site.

Existing quarrying operations extend below the groundwater table and dewatering is currently undertaken. Surface water from the site is discharged via an outfall which ultimately discharges into Alltami Brook under consent.

Construction of the landfill within the base of the quarry void will require dewatering to be carried out and this will need to continue until such time as sufficient waste has been deposited to prevent basal heave. A large detention pond will be retained in the north west corner of the site to ensure that surface runoff and dewatering water can be adequately controlled prior to discharge via the existing outfall arrangements.

During the construction phase the main potential for impact upon the groundwater and surface water environments will be through the uncontrolled discharge of surface and dewatering waters laden with suspended soils and/or the accidental spillage of fuels and oils from plant and equipment. These impacts will be readily mitigated by the adoption of standard good practice with respect to plant and equipment maintenance, materials storage and the careful control of runoff, water storage and discharge.

A similar range of potential impacts will apply during the operational phase and adoption of the same mitigation measures as applied during construction will ensure that these impacts are not significant. In addition, during the operational phase, the landfilled wastes will generate contaminated leachate which adds a further potential risk to the groundwater and surface water environments. The risk will be managed by ensuring full engineered containment of the landfilled wastes and close control over leachate volumes generated within the landfill. Leachate will be collected and discharged under controlled conditions to foul sewer.

Traffic and Access

Veryards Opus Ltd has undertaken an assessment of traffic impacts using guidance published by the Institution of Highways and Transportation 'Guidance for Traffic Impact Assessment'. Discussion with the Local Highway Authority (Flintshire County Council) confirmed that the following issues should be assessed;

- Operation of existing traffic signal controlled junction at A494/Pinfold Lane, Alltami, and
- Access into the proposed site off Pinfold Lane.

The site is well served by the A494 trunk road and Pinfold lane and is close to the A55. The site is located within an industrial area where numerous heavy goods vehicle movements already occur.

Traffic generated by the facility would be evenly spread throughout the day. Based upon the worst case assumption that the site will receive 150,000 tonnes in total of municipal solid waste and non-hazardous industrial and commercial waste each year, Veryards Opus Ltd has concluded that the resulting traffic related to waste deliveries will not have a significant impact upon the traffic signalised junction which gives access to the site from the A494.

The impact upon the wider road network is also considered to be insignificant.

The proposed facility will offer significant traffic benefits as trips by Heavy Goods Vehicles will be reduced through residential areas when compared to existing landfill facility operated by A D Waste at Brookhill.

Noise and Vibration

The noise and vibration assessment undertaken by Amec Earth and Environmental has adopted guidance and methodology from various sources including relevant British Standards, Environment Agency guidance, Highways Agency guidance, Minerals Planning guidance and guidance from the Welsh Office relating to the road traffic noise.

The assessment has been supported by a noise survey to allow baseline conditions to be established against which the effects of the proposed project can be assessed.

The noise environment at existing potential noise sensitive receptors in the locality of the proposed landfill site is generally dominated by road traffic noise associated with the A494, A55 and to a lesser extent, Pinfold Lane.

It should be noted that quarrying operations will continue during landfill construction and earlier phases of landfilling and the construction of the landfill is likely to involve the use of very similar plant and machinery to that already employed at the site. The majority of the landfill construction works will take place within the quarry void and will therefore be screened from surrounding land users. The construction of the internal haul road has the potential to cause a temporary adverse impact upon nearby residents, particularly Parry's Cottages.

With respect to operational noise, there is the potential for a minor adverse impact at Parry's Cottages as a result of lorry movements along the internal haul road and during waste unloading.

A moderate adverse impact may occur during the day at Parry's Cottages and a minor adverse impact at the Holiday Inn Hotel during the day associated with redistribution and compaction of wastes within the closest cell to these receptors.

During the operational phase, the use of the gas flare and gas utilisation engines during the day and night is considered unlikely to result in disturbance to nearby noise-sensitive receptors.

The landfill operator will be required to prepare and implement a noise management plan for the construction phase and to operate the site in accordance with best practice. A community liaison group will also be established at which any concerns about noise and vibration issues can be considered and actioned by the operator as appropriate.

Additional mitigation will be provided by the erection of an acoustic screen along part of the southern boundary of the site to minimise impact upon residents at Parry's Cottages. The precise siting and construction details of the screen will be determined during the detailed design phase.

It is considered unlikely that vibration will be an issue during the construction and operation of the landfill.

Air Quality

The air quality assessment undertaken by Amec Earth and Environmental has identified that existing air quality within the locality of the proposed landfill site is influenced by current quarrying activities which provides a source of dust, together with general traffic movements on the local road network which give rise to emissions of pollutants from vehicle exhausts.

The site and locality do not fall within an Air Quality Management Area (AQMA).

Potential impacts upon air quality have been identified and assessed for both the construction and operational phases.

During construction the main source of impact upon air quality will be the potential for dust to be generated from earthmoving operations and emissions from plant and equipment used on site. The employment of good working practice will ensure that emissions from these sources do not cause and nuisance to local land users. The operator will produce a construction environmental management plan (CEMP) within which specific measures for controlling dust and other emissions will be identified.

During the operational phase when waste is being deposited, the principal sources of potential impact upon air quality will be dust generation from waste deposition and vehicle movements on the haul roads, emissions from the gas flare and engines and odour and landfill gas generation from deposited waste.

Dust management during the operational phase will be achieved by adhering to standard operating procedures applied at landfill sites. The main internal haul road will have a metalled surface so that it can be kept clean and free of mud and debris. Stockpiles of soil materials will be managed to minimise dust and dust suppression will be employed as necessary during dry periods of weather.

Odour will be controlled primarily by ensuring that potentially odorous wastes are covered immediately after deposition and by ensuring that the active working area where wastes are being deposited is restricted in size. At the end of each working day, cover soils will be placed over the deposited wastes to a suitable depth to ensure that significant odour cannot be generated. The use of cover soils in this manner will also minimise the risk of the site becoming attractive to vermin and gulls.

Landfill gas generated from the deposited waste will be confined within the engineered containment system provided for the site. Gas will be collected in a controlled manner via a specially designed and engineered collection system and conveyed to a landfill gas management plant located in the north east corner of the site. Here it will either be flared within a closed flare system or (depending upon gas quality and quantity) used as fuel to drive engines from which energy can be produced.

Assessment of development related traffic during the operational phase has been undertaken using the Highways Agency DMRB 11 methodology. The results of predictive modelling from this method have shown that only very small increases in

pollutant concentrations (nitrogen dioxide and PM₁₀) will occur for receptors located on the A494 and Pinfold.

It has been agreed with Flintshire County Council that additional baseline monitoring for PM₁₀ will be undertaken to provide a more comprehensive baseline for this pollutant once planning consent has been secured.

Ecology

A series of ecological surveys have been undertaken at the site during 2006 to determine its ecological value. These surveys have been augmented by a desk study to identify other features of ecological interest in the locality.

Within the site, most of the area to be occupied by the landfill project has already been heavily disturbed and degraded by ongoing quarrying operations. As a result the ecological value of the majority of the site area is very low.

The main habitat of value is the SSSI/SAC which lies beyond the southern boundary of the planning application site area. It is already protected from quarrying operations by a permanent metal fence and it will remain beyond the boundary of any landfill construction and operational activities.

During surveys undertaken in 2006 a population of breeding great crested newt was confirmed in two ponds located within the SSSI/SAC. There was limited evidence of badger foraging on the site but no badger sett was found within the site itself. The areas of the site which have already been disturbed by quarrying have very little potential for badger foraging.

The breeding bird survey found two British Trust for Ornithology (BTO) Red List species (song thrush and bullfinch) and four Amber List species (willow warbler, dunnock, swallow and woodpecker) on site. The main parts of the site which have value for breeding birds are the semi-mature deciduous woodland areas which run around the boundaries of the site. These woodland areas will be retained.

The reptile survey confirmed that the area of the SSSI could provide suitable habitat for grass snake, however, no animals were observed.

During construction, six potential impacts included potentially adverse effects on breeding birds, badgers and great crested newts and their habitat, through activities such as the use of noisy machinery and resultant disturbance, injury to animals by vehicles, runoff drainage and associated soil erosion damaging newt habitat and the generation and deposition of dust impairing the quality of habitats for great crested newt. During the landfilling operations, three potentially adverse ecological impacts were identified. These were similar to construction impact: effects of dust generation, surface water runoff causing flooding and erosion and the potential for site traffic to injure a badger if it strayed onto the site.

A range of mitigation measures are proposed for both the construction and operational phases of the development to reduce identified impacts to acceptable levels. These include the erection of temporary amphibian exclusion fencing around the entire site to

prevent any great crested newts from straying into the working area. If any great crested newts are found within the site, they will be translocated under license to the SSSI/SAC. There will be robustly designed drainage for both the landfill cell design and the access road, so that all surface water runoff will be routed away from the SSSI towards the balancing pond in the north of the site. Dust suppression measures will be employed during all construction and landfilling operations. In addition, shrub and tree planting along the access road between the SSSI/SAC and the proposed landfill will act to entrap atmospheric particulates and prevent their dispersal into the reserve. To prevent injury to any badger which might stray onto the site, a strict vehicle speed limit of 10mph will be imposed on site, there will be no night time working and clear signage will be erected to advise all drivers that they should take care and look out for badgers.

Once the proposed mitigation measures are implemented, the identified residual ecological impacts during both construction and operational phases of the landfill would be reduced to acceptable levels. Opportunities have been sought to enhance the ecological value of existing habitats on site and enhancement and extension of the existing SSSI is proposed to improve conditions for great crested newts.

Site restoration proposals include for new extensive woodland planting and the provision of areas of grassland and wildflower meadow on the area of the site to be taken up by the landfill footprint. Once restoration is completed the ecological value of the site will be significantly enhanced compared to the current situation.

An Ecological Management Plan is proposed to ensure the future active management of the SSSI/SAC.

Summary

There is a real and pressing need for landfill void space within Flintshire for both municipal solid waste and non-hazardous commercial and industrial waste. The proposed landfill project at Parry's Quarry will help meet this need.

Flintshire Council have included the site within their Areas of Search for suitable locations for new waste management facilities within Flintshire and have accepted in principle the potential of the site for landfill.

The Environmental Impact Assessment, based upon a carefully considered design, has demonstrated that the project can be implemented without major adverse environmental effects. The restoration proposals for the site can provide a site at completion of landfilling which is significantly enhanced with respect to ecological value and which could provide a valuable resource as public amenity open space.

1.0 INTRODUCTION

This Environmental Statement has been prepared by AMEC Earth and Environmental UK Ltd on behalf of Robin Jones and Sons Ltd. to accompany a Planning Application for the construction and operation of an open gate landfill site which shall receive Municipal Solid Waste and Non-Hazardous Industrial and Commercial wastes.

The proposed landfill site is to be located at Parry's Quarry, some 1km north east of the village of Alltami in Flintshire, north east Wales, Flintshire (National Grid Reference SJ 2755 6652). The A494 Mold Road bounds the southern perimeter of the site with Pinfold Lane to the west. A dismantled railway line runs to the north and east of the site.

The site is under the ownership of Robin Jones and Sons Ltd. This company currently operates a waste transfer station and conducts mineral extraction activities at the site.

The location of the proposed landfill site is shown in Figure 1.1. The title boundary of land registered to Robin Jones and Sons Ltd is shown in Figure 1.2. The planning application boundary for the proposed development is also shown in Figure 1.2. The planning boundary for the existing quarrying operation is shown in Figure 1.3.

Figure 1.4 provides an aerial photograph for the site (taken in November 2006) with the planning application boundary superimposed upon it.

1.1 Historical Land Use Context and Background to Proposed Landfilling Activities

Historical maps dating to 1874 show that there were, at that time, two brick works present within the proposed landfill site. Castle Brick Works was located to the north of the site and a further unnamed brickwork to the south east. A dwelling described as Ewloe Barn was also present situated in the centre of the proposed landfill site. To the west of the site and south of Castle Brickworks there was an area of rough pasture which extended south and south easterly joining on to a patch of woodland which bordered Ewloe Barn to the east. Historical maps from 1912 show that the area of rough pasture was no longer present having been exploited for mineral extraction. The small patch of woodland to west of Ewloe Barn had been significantly reduced as part of this quarrying activity. There was little significant change in the landform and use of the proposed landfill site until 1963 at which time Ewloe Barn was no longer present on site and quarrying had extended further south and east removing the remaining woodland in the centre of the site during this process. Later maps from 1978 show two disused clay pits to the north west and south west of the proposed landfill site. A small pond was present to the north west of the site and a larger one to the south at this time.

Until 1999/2000 Parry's Quarry was owned by Hanson Brick Ltd., who found that the nearer surface clay contained too much silicon for brick manufacture. Underlying clay material was found to be far more suitable for this purpose. However, as quarry workings progressed the amount of overburden required to be moved to extract the underlying

clay became uneconomic. The quarry was then sold to Robin Jones and Sons Ltd who wished to use the available mineral as civil engineering fill material and also wished to develop the area as a waste transfer site and future landfill site.

The creation of the void as a result of historic and ongoing quarrying operations has created significant capacity for the landfilling of waste materials.

1.2 Scope and Layout of the Environmental Statement

This Environmental Statement (ES) document represents the outcome of the Environmental Impact Assessment process and is divided into 5 main parts, i.e.;

- Description of the proposed project presented - Chapter 2
- Details of baseline conditions within and surrounding the proposed landfill site – Chapter 3
- Description of generic methodology employed for the Environmental Impact Assessment – Chapter 4
- Assessment of environmental impacts, proposed mitigation measures and scale and magnitude of residual impacts after mitigation – Chapters 5-11
- Environmental management plan which draws together the commitments made in each of the environmental impact assessment chapters and sets out responsibilities and timescales for implementing these commitments in a transparent manner – Chapter 12

Volume 1 provides the text of the ES with Volume 2 containing the supporting Figures and Appendices.

Table 1.1 (below) lists each of chapters within the Environmental Statement and the relevant contributors to each chapter.

Table 1.1 Contributors to the Environmental Statement

Chapter	Prepared By:
1.0 Introduction	AMEC Earth and Environmental Ltd
2.0 Project Description	AMEC Earth and Environmental Ltd
3.0 Baseline Conditions	AMEC Earth and Environmental Ltd
4.0 EIA	AMEC Earth and Environmental Ltd
5.0 Planning Framework	TACP Ltd
6.0 Landscape and Visual Impact Assessment	Planit EDC Ltd
7.0 Hydrology and Hydrogeology	AMEC Earth and Environmental Ltd
8.0 Traffic and Access	Veryards Opus Ltd
9.0 Noise Assessment	AMEC Earth and Environmental Ltd

10.0 Air Quality	AMEC Earth and Environmental Ltd
11.0 Ecological Impact Assessment	AMEC Earth and Environmental Ltd
12.0 Summary and Ecological Management Plan	AMEC Earth and Environmental Ltd

1.3 Obtaining Copies of the Environmental Statement

A copy of the Environmental Statement can be viewed by appointment at Flintshire County Council's offices in Mold, Flintshire (Contact the Planning Department). Full paper copies can be obtained at a cost of £100 per copy from AMEC Earth and Environmental UK Ltd (Tel: 01352-751761).

2.0 PROJECT DESCRIPTION

2.1 Outline of Proposed Project

The proposed project comprises the landfilling of solid waste. Waste input is anticipated to comprise Municipal Solid Waste (MSW) which is typically made up of household waste together with commercial waste and street sweepings collected by a local authority or by a contractor acting on its behalf. The exact composition of MSW varies between authorities but typically household waste comprises 80-90% of the total waste stream. In addition to MSW generated by the authority or authorities which may utilise the site, it is also anticipated that the site will accept industrial and commercial non hazardous waste derived from private sources.

The landfilling operations will be undertaken within the registered title boundary of land which is currently under the ownership of Robin Jones and Son Ltd. The registered title boundary is illustrated in Figure 1.2. The red line planning boundary is also shown in Figure 1.2 and excludes the SSSI and the former railway line corridor where no physical works associated with the development are proposed. The area encompassed by the red line boundary is approximately 16.3 hectares.

The layout of the main components of the proposed project is illustrated in Figure 2.1. The landfill footprint where waste disposal will occur occupies an area of approximately 10 hectares.

2.2 Demonstration of Need for the Landfill Site

The assessment of need for the proposed landfill site has involved the following key activities;

- Consultations with Flintshire County Council Planning and Minerals and Waste Officers.
- Review of the North Wales Regional Waste Plan for the period 2003-2013 (Welsh Assembly Government, 2004) and Flintshire County Council's Waste management Strategy (Draft Consultation Document, 2005).
- Commissioning of a study by waste management specialist consultants Enviro Consulting Ltd (Enviros) to determine the current and projected local and regional market demands for solid waste management and disposal.
- Extensive consultations have taken place between AMEC Earth and Environmental with Flintshire County Council and these have determined that there is a real and quite urgent need for new landfill void space to be available to meet the County's future requirements with respect to municipal solid waste disposal. Currently MSW disposal to landfill occurs to a single site within the

authority boundary, i.e. the landfill facility operated by A D Waste at Brookhill. It is understood that capacity at this facility will be exhausted by mid 2007.

- Consultation with the Environment Agency regarding waste disposal to landfill in Flintshire.

The process of consultations has determined that no other proposals for new landfill projects have been submitted to the Council for consideration at the time of writing of this Environmental Statement and that no other party has declared a formal intention to submit such a proposal.

2.2.1 Current Local and Regional Market for MSW Disposal to Landfill

In order to determine the current local and regional market for MSW a study was commissioned by AMEC Earth and Environmental UK Ltd on behalf of Robin Jones Ltd and undertaken by Enviro. The outcome of the study was a report entitled "*Waste Arisings Study to Support Planning Application for Parry's Quarry*" and dated April 2006 (see Appendix 2.1).

The principal purpose of the study was to assess the potential waste that may be available for landfilling from local authorities in the vicinity of the proposed landfill site. As a result it included an appraisal of current and projected MSW arisings for the authority areas of Flintshire, Conwy, Denbighshire, Chester, Wirral and Wrexham. The study describes current and projected arisings of MSW and existing and proposed future targets with respect to recycling, composting and other waste management options which may divert MSW away from the landfilling option. The status of each authority's contracts for waste management involving MSW is also described.

The Enviro study identifies that the current population within the Flintshire County Council authority boundary is 147,000. As Flintshire is a unitary authority it is responsible for both waste collection and subsequent management including disposal.

The total MSW arisings for the year 2004/5 were 100,070 tonnes. It is apparent that over the last 15 years, total MSW arisings have increased in accordance with similar trends across Wales and England. The proportion which has been recycled has also increased from 6.07% to 18.28% i.e. 18,296 tonnes in 2004/05. All MSW which is not recycled is currently landfilled (81,774 tonnes in 2004/2005).

In accordance with requirements to comply with the National Waste Strategy for Wales 2002, Flintshire will have to increase the rates of recycling of MSW from the current level of 18.28% to 25% in 2006/7 and then to 40% in 2009/10.

2.2.2 Future Market for MSW Disposal to Landfill

As part of their study, Enviro made projections of future waste arisings for all the authority areas which were included within the study. This data is important in the

context of demonstrating need for landfill void space over the next two decades over which landfilling at the proposed project site is likely to extend.

Enviros have assumed for their projected waste arisings assessment that the growth in MSW arisings will be 2% per annum from 2006 until 2009/10. This assumption is based upon studies by the Department for Environment Farming and Rural Affairs (DEFRA) which have tracked the growth of household waste. As stated above, household waste forms the majority of MSW arisings. In calculating the waste forecast figures, Enviros have taken account of the Landfill Allowance Trading Scheme (LATS) whereby the UK government allocates a specified amount of landfill allowance to waste disposal authorities each year. Authorities then have the choice to adhere to the allowance they are allocated, acquire allowances from other authorities or sell their surplus allowances. The allowances allocated to all authorities are calculated in order that the sum total of permitted landfilling meets European Landfill Directive targets.

In England the scheme has been in place since April 2005 and in Wales it was introduced in October 2004 with allowances having been calculated up to 2020. Whilst in England trading of allowances between authorities is permitted, in Wales the trading agreements have not been implemented and the allowances have been set only up until 2010. In addition, the overall biodegradable content of MSW in Wales is set at 61%. The penalty for every excess tonne of such waste which is landfilled is £200.

In 2004/5 some 18,300 tonnes of MSW was recycled in Flintshire although there is some uncertainty as to what proportion of this was biodegradable municipal waste (BMW). Currently, Flintshire needs to divert 10,000 tonnes of BMW to be compliant with its LATS allocation. By 2009/10 Flintshire will need to divert approximately 30,000 tonnes of BMW away from landfill and therefore a significant increase in composting or other mechanisms to take biodegradable materials out of the landfill waste stream will be required.

Table 2.1 below is drawn from the Enviros study report and illustrates the probable amounts and fate of MSW generated in 2009/10.

Table 2.1 Fate of Flintshire's Municipal Solid Waste in 2009/10

Flintshire	Calculation	Maximum (tonnes)	Minimum (tonnes)
Total MSW	A	110,485	110,485
BMW (61%)	B	67,400	67,400
Recycling at current levels	C	18,296	-
Recycling at target levels	D	-	44,200
BMW diversion at current levels	E (=Cx50%)	9,148	-
BMW diversion at target levels	F (=Dx50%)	-	22,100

LATS allocation	G	36,482	36,482
BMW requiring diversion	H=B-G	30,900	30,900
Additional BMW diversion required to achieve LATS	I=B-G-(E or F)	21,800	8,800
Total BMW to landfill	J = B-(E or F)	58,200	45,300
Total MSW Landfill	K = A-(C or D)	92,200	66,300

From this table it is apparent that the amount of MSW which is likely to be sent to landfill for disposal, should no other waste management options become available, will range from 66,300 to 92,200 tonnes. The lower of the two tonnage figures assumes that Flintshire will achieve its recycling target of 40% of all MSW in 2009/10.

Table 2.2 below shows the projected tonnages of MSW to landfill for all the authority areas included in the study assuming either that recycling occurs at the current rate or alternatively that recycling targets are fully met.

Table 2.2 Summary Tonnages to Landfill Across Authority Areas 2009/10

Local Authority	LATS Allowance	Landfill tonnage based on current recycling targets performance	Landfill tonnage based on future targets for recycling
Denbighshire	24,000	51,500	37,900
Wrexham	32,837	61,250	43,800
Conwy	34,300	78,600	57,000
Flintshire	36,482	92,200	66,300
Merseyside (Wirral)	310,848	387,800	303,000
Cheshire (Chester)	167,818	388,000	297,100

In either circumstance it is apparent there will be a continuing demand for considerable landfill void space at this time. Whilst it is recognised that certain authorities have contracts in place which are likely to ensure available void space within their authority area for the next few years, others do not have such provisions.

- Denbighshire, whose geographical boundary adjoins Flintshire, currently has no landfill void space at all and exports its MSW to landfills at Llandulas and Chirk.
- Wrexham disposes the bulk of its MSW to the Penybont landfill. This site is expected to close in 2009 due to contract restrictions.

- Cheshire will have a need for additional landfill capacity by around 2010 even if increases in recycling capacity are achieved.
- The current lifespan of the Llandulas landfill in Conwy is 10-12 years. More space is available but utilisation will require a planning consent to be secured for an extension to existing operations.
- In Wirral the capacity of the 3 No. sites which have been mainly utilised for MSW disposal over recent years was due to be exhausted in 2005. A new site in Haydock (Lyme and Wood) will continue to take waste along with the Lord St Helens Quarry under a contract which will run until 2008.

In addition to the above further evidence with respect to the demand for landfill void space in Flintshire has been acquired through a review of municipal solid waste inventories for recent years. According to information provided by the Environment Agency, Flintshire Open Gate landfills (i.e. Standard Landfill and Brookhill Landfill) received 391,674 tonnes, 162,420 tonnes and 154,343 tonnes of MSW for the years 2002/3, 2003/4 and 2004/5 respectively. The figure for 2003/3 is unusually high as this relates to a period when both Standard landfill and Brookhill landfill were receiving waste at near full capacity. Since that time waste receipts at Standard landfill have reduced dramatically and the site is now closed. Given that the MSW figure for 2002/3 is very high and that the total volume of MSW disposed in each of the years exceeds that which is currently generated within Flintshire alone, import of MSW from areas outside Flintshire must account for some of the waste inventory. The EA report that a small percentage of the waste being landfilled in Flintshire in recent years has originated in Denbighshire and Wrexham.

According to EA figures published on their web site, approximately 500,000 tonnes of waste of all types was disposed to landfill in the year 2002/3. Of this amount, three landfills received the vast majority of waste i.e. Standard landfill, Brookhill landfill and a landfill near Greenfield which accepted approximately 150,000 tonnes of inert construction and demolition waste.

Since the closure of the Standard landfill site, there is now only one landfill within Flintshire that receives MSW i.e. the A D Waste site at Brookhill. Data supplied by the Environment Agency for this site includes all waste arisings for the last five years i.e. 2001-2006 (see Appendix 2.2). Over this time, the total tonnage of waste received at the site from all sources has approached 1 million tonnes. It is apparent from the data that the vast majority of the waste received at the site over this period was sourced from within the Flintshire authority area.

It would appear therefore that there is a clear demand for landfill void space for MSW and non-hazardous commercial and industrial waste within Flintshire and that there are also significant opportunities for the proposed site to take MSW from other authorities in

the locality from 2008-2010 onwards. Note that a new landfill facility is likely to be very attractive to local private generators of industrial and commercial non hazardous solid waste both within Flintshire and outside the County.

2.3 Regional and Local Waste Strategy

The current strategy relating to waste management in North Wales is presented in the North Wales Regional Waste Plan which was endorsed by the Welsh Assembly Government in March 2004. The plan was originally intended to cover the period 2003-2013 but a new regional draft plan will be issued for consultation in May 2007 with endorsement of the revised document likely in November/December 2007. Until such time as the new plan is issued, Flintshire County Council has indicated that the existing plan remains the basis for strategic thinking on waste management in the region.

The strategy includes the councils of Flintshire, Denbighshire, Gwynedd, Anglesey, Powys and Wrexham and the Snowdonia National Park Authority.

The plan identifies that in accordance with regional planning guidance as determined within "Regional Planning Guidance for North Wales" (2002) and Technical Advice Note TAN 21 on waste four key principles should be applied when assessing proposals for new waste management facilities i.e.

- Sustainability – reflecting a commitment to sustainable development in accordance with the Best Practicable Environmental Option Assessment (BPEO) and Sustainable Waste Management Options Assessment (SWMO) as outlined in TAN 21
- Proximity – objective is to locate facilities as close as practicable to the sources of waste and other compatible waste related uses to limit transport requirements and associated environmental impacts
- Regional self sufficiency – the intention is that the vast majority of waste generated should be managed within the region rather than exporting it to waste management facilities elsewhere
- Waste hierarchy – the hierarchy is ranked in order of preference as follows;
 - Reduce Waste Arisings
 - Re-use Waste
 - Recover waste through recycling and composting
 - Recover energy from waste
 - Dispose waste via landfill or incineration without energy recovery

The plan indicates that some 2.2 million tonnes of waste of all types was generated in the region in 1998/99 and that the figure for Flintshire was some 560,001 tonnes. The latter compares closely with Environment Agency statistics obtained for 2002/3 which indicate that around 500,000 tonnes of waste was landfilled in Flintshire during this year.

The plan recognises that the total amount of waste generated continues to rise and that by 2013 some 2.9 million tonnes of waste would be generated within the region assuming a 3% growth rate in waste arisings in the period 1999-2013. The plan states that the expected total waste arisings in Flintshire in 2013 would be some 706,749 tonnes of which the majority would be comprised of Municipal Solid Waste (128,409

tonnes), Commercial and Industrial Waste (308,852 tonnes) and Construction and Demolition Waste (247,009 tonnes).

The plan initially considers 6 options for managing the regions waste. The options vary with respect to the degree to which waste is re-used, recycled, recovered and composted. Common to all the options however is that landfill will remain as a significant waste management requirement irrespective of the amount of waste which is managed by other means.

The plan endorses a seventh hybrid option which has both mechanical biological treatment and energy from waste capacity as well as high levels of recycling and composting. This option ranked second amongst the 7 options according to the sustainability assessment which was carried out. This assessment incorporated a BPEO study and a Life Cycle Assessment.

Whilst recycling and composting are readily understood in terms of their scope mechanical biological treatment and energy from waste require some further description.

Mechanical biological treatment plants generate three principal material streams i.e. ferrous and non-ferrous metals, a bio-stabilised stream that can be used for landfill cover and a residual stream that can either be landfilled or converted into a secondary fuel.

Energy from waste may involve combustion of waste such as organic domestic refuse without pre-treatment (so called mass burn incineration). Alternatively the waste can be converted into a fuel by processes such as gasification or pyrolysis or forming into briquettes. Ultimately the fuel has to be burnt to yield energy which can be used for electricity generation.

Table 10 in the plan document identifies the capacities required in Flintshire for 2013 for the range of waste management facilities required to implement the hybrid option. Notably, landfill remains a significant element of the facility provision with a capacity requirement of 112,266 tonnes per annum.

In order to determine the current status of implementation of the Regional Waste Plan in Flintshire, AMEC E&E has contacted Andy Macbeth (Environmental Services Manager at Flintshire County Council) in addition to undertaking a review of Flintshire's Waste Management Strategy published on the Council's web site as a draft for consultation document in December 2005.

The key findings from the review and discussions are that there will remain a requirement for landfill void space within Flintshire to deal with MSW and industrial and commercial waste. In accordance with European Directive requirements the proportion of MSW sent to landfill will have to decrease significantly over the coming years and these reduction targets are as indicated within the Enviro report discussed above and presented in Appendix 2.1.

The Council intends to continue to extend its recycling and re-use initiatives. Currently, the biodegradable waste which is diverted from landfill is limited to green waste collected at the kerb side and from Civic Amenity sites. At present approximately 8000 tonnes per annum of green waste is recycled via a composting facility based at Greenfield. Finding

markets for the composted material has been difficult and there has been over capacity of composted green waste but some recent improvement in this situation has occurred.

In order to divert the required amount of biodegradable MSW away from landfill in the future the Council is considering options relating to treatment of such waste (to include black bag domestic waste). It is understood that the Council is currently examining possible procurement routes for a Mechanical Heat Treatment Plant (MHT) which may involve batch, steam processing of biodegradable waste to produce a high calorific values waste which is normally referred to under the generic title of Refuse Derived Fuel (RDF). The pursuance of this option would be broadly compatible with the outcome of the North Wales Regional Waste Strategy which promoted Mechanical Biological Treatment as a preferred technology for dealing with MSW. There would be a clear need to identify a market for RDF in order to ensure that an MHT plant was sustainable from an economic perspective. Andy Macbeth has indicated that such a plant would probably not be restricted to receipt of Flintshire's waste and would certainly benefit from economies of scale by accepting waste from outside Flintshire's borders.

Andy Macbeth has indicated that it could be possible to have a MHT commissioned and in service by 2008. This is seen as a very optimistic timescale. Nevertheless, it is recognised that the diversion of biodegradable waste away from landfill may have an impact upon the proposed Parry's Quarry landfill project towards the middle and end of the proposed project lifetime. Any reduction in MSW input to the landfill is likely to be balanced by increased input of commercial and industrial non hazardous waste.

2.4 Siting of Waste Management Facilities and Alternatives for Landfill Site Locations in Flintshire

2.4.1 General context

The North Wales Regional Waste Plan provides guidance on the siting of waste management facilities of which the following are applicable to the siting of a landfill;

- No facility should be located within the National Park, Area of Outstanding Natural Beauty (AONB), designated ecological sites (e.g. a Site of Special Scientific Interest or SSSI) or other site of national or local importance unless it is in the national interest or can be demonstrated to meet the tests specific in Planning Policy Guidance Wales.
- Each authority shall encourage within its UDP the siting of waste management facilities as close as possible to the community and/or industrial activity where the waste is generated.
- Each UDP shall consider allocating additional land for waste management facilities at or adjacent to existing waste management sites. Where this is not practical the new sites shall be allocated on previously developed land, at existing industrial sites, or on land already allocated for industrial or employment purposes.

The plan encourages the siting of facilities which have good access to the primary road network and main towns and villages. Specific potential locations for waste

management facilities which are identified include allocated employment industrial land and active or disused quarries.

An assessment of the compliance of the siting of the proposed landfill site at Parry's Quarry with relevant policies and plans is given in Chapter 5 of this environmental statement.

2.4.2 Alternative sites owned by Robin Jones and Sons Ltd

Robin Jones and Sons Ltd do operate a number of other mineral extraction sites in North Wales and therefore have access to land elsewhere where waste landfilling may be possible. However, none of these sites lies in Flintshire where the demand for waste disposal is real and pressing and none are so well served by transport links.

2.4.3 Locations identified by Flintshire County Council

Flintshire County Council has undertaken an Area Search to identify suitable locations for the siting of waste management facilities. The Council published proposed changes to the Unitary Development Plan (UDP) in November 2006. The following preferred areas of search for waste management facilities have been identified within this document;

Ewloe Barn Industrial Estate
Parry's Quarry and Pinfold Lane Quarry, Alltami
Springhill Quarry, Bagillt
Mount Pleasant Road (North) Buckley
Former Power Station, Connah's Quay
Crumps Yard, Dock Road, Connah's Quay
Land to the east of Shotton paper, Deeside Industrial Park
Land adjacent to Green Waste Composting Site, Greenfield Business Park
Site adjacent to Mostyn Docks, Mostyn
Parc Bychan Quarry, Rhosesmor
River Lane, Saltney
Prince William Avenue, Sandycroft
Deeside Development Zone

The original UDP and the proposed changes to it have been subject to a Sustainability Appraisal and Strategic Environmental Assessment which was undertaken by Hyder Consulting on behalf of the Council. The report prepared by Hyder on these matters was published in October 2006 (Hyder Report No. 003-NH50993-NHR-02).

Hyder undertook an assessment of Council Policy EWP 6 which identified the potential areas of search listed above. The report comments that "Each of these sites has been subject to a high level review to identify the key strengths and weaknesses of each broad area". The report presents a table (as Table 8-7) which details the key sustainability strengths and weaknesses of each area of search.

The Ewloe Barn Industrial Estate, Parry's Quarry and Pinfold Lane Quarry, Alltami are clustered together for consideration within this table. The key sustainability strengths which apply to this cluster of sites are identified as "Limited number of residential areas immediately nearby" and "Well located in relation to potential waste sources, e.g. Mold, Buckley and Deeside". The key sustainability weaknesses are identified as "Presence of Alltami Brook – potential pollution issues" and "Deeside and Buckley Newt SAC and the Buckley Claypits and Commons SSSI in close proximity to all areas but not as close to the Pinfold Lane Quarry". The recommendation made relating to this cluster was that it should be demonstrated that "There should be no adverse impacts on the integrity of the designated sites" if a waste management facility was to be located here.

With specific reference to Parry's Quarry, Robin Jones and Sons Ltd made a representation in 2003 to the Council on the original draft UDP. The company sought zoning for the site for industrial use and as a replacement landfill site for the County in order to create a positive use of the land as an allocation for the land had not been given in the UDP. The Council responded to Robin Jones and Sons Ltd on 25th October, 2006 rejecting the zoning of the land for industrial use. However, the response in relation to landfilling was as follows;

"Partially accepted. It is recognised that the characteristics of this site would lend themselves for use as a landfill operation i.e. the central positioning of the site between the Deeside settlements and the settlements of Mold, Mynydd Isa and Buckley; the positioning of the site away from population centres; the beneficial transportation routes (A494&A55); and the existence of clay deposits within Parry's Quarry. It is proposed that the site be included within the UDP as a preferred area of search which potentially could accommodate a waste management use but not as a formal allocation".

Of the other localities included within Table 8-7 of the sustainability report, Hyder commented as follows;

"All of the....search areas for new waste management facilities have the potential to adversely impact upon the integrity of a number of designated sites of international and national importance including the Dee Estuary, the River Dee, The Deeside and Buckley Newt Sites and Halkyn Mountain." Hyder infer that the search areas were probably identified by Flintshire because of their proximity to centres of population within Flintshire and suggest that "there is inevitably going to be a conflict between the most suitable locations from a proximity principle perspective (i.e. the need to manage to the waste as close to its sources as possible) and the need to protect these designated sites."

Of great significance in terms of suitability of the Areas of Search for landfilling is their locations relative to floodplain. AMEC E&E consider it very likely that the Environment Agency would have major concerns over proposals to locate a landfill within a floodplain area due to factors including the potential for erosion, taking up of flood plain store volume, and loss of hydraulic containment. Of the areas of search identified, the following sites are located within or adjacent to a floodplain;

Springhill Quarry, Bagillt
 Former Power Station, Connah's Quay
 Crumps Yard, Dock Road, Connah's Quay
 Land to the east of Shotton paper, Deeside Industrial Park
 Land adjacent to Green Waste Composting Site, Greenfield Business Park
 Site adjacent to Mostyn Docks, Mostyn
 River Lane, Saltney
 Prince William Avenue, Sandycroft
 Deeside Development Zone

Hyder comment that these sites would not be sustainable with respect to policy relating to adaptation to climate change.

The remaining sites are at Ewloe Barn, Parry's Quarry, Pinfold Lane, Mount Pleasant Road and Rhosesmor. The site at Ewloe Barn is clearly less favourable for landfilling than the others as there is no existing void into which landfilled wastes could be placed and the site is in active use for industrial/commercial purposes. The site at Rhosesmor is situated within a landscape of historic importance whereas the other sites are not positioned within areas of such landscape quality.

The site at Mount Pleasant Road, Buckley has similar benefits in terms of proximity to waste sources as Parry's Quarry and Pinfold Lane. However, it too is situated adjacent to an SSSI/SAC with respect to Great Crested Newts and is significantly nearer to residential areas than Parry's Quarry and Pinfold Lane.

The sites identified within the area search conducted by Flintshire County Council which appear to have the greatest potential with respect to landfilling operations are Parry's Quarry and Pinfold Lane. Parry's Quarry is the larger of the two sites and quarrying has extended to greater depths at the time of preparation of this Environmental Statement. It therefore provides greater potential void space although it is recognised that the two sites have generally very similar benefits and disbenefits for landfilling operations.

In order to determine the availability of quarry or extraction voids within and immediately adjacent to the boundaries of Flintshire, the BGS GeoIndex web site was searched to determine the names and locations of active mines and quarries. The listing obtained is very similar to that included in the study of alternative landfill site locations undertaken by Golder Associates on behalf of Castle Cement in support of a planning application for the Padeswood Works landfill. Table 2.3 below presents the sites identified and identifies their location, geological context and groundwater vulnerability status.

Table 2.3 Potential Quarry Sites for Landfill

Site Name	Location	Authority Area	Grid Reference	Geology	Aquifer Status
Aberdo	Pentre Halkyn	Flintshire	SJ 318700, 373300	Limestone	Major aquifer Highly Permeable
Bryn Mawr	Brynford	Flintshire	SJ 318895, 373530	Chert	Major aquifer

					Highly Permeable
Fron Haul	Ysceifiog	Flintshire	SJ 315700, 370600	Sand and gravel	Major aquifer Highly Permeable
Halkyn		Flintshire	SJ 319000, 372000	Limestone	Major aquifer Highly Permeable
Hendre		Flintshire	SJ 319400, 368000	Limestone	Major aquifer Highly Permeable
Pant	Halkyn	Flintshire	SJ 319800, 370200	Limestone	Major aquifer Highly Permeable
Trimm Rock	Cilcain	Flintshire	SJ 319055, 366050	Limestone	Major aquifer Highly Permeable
Maes Mynan	Nannerch	Flintshire	SJ 311500, 372100	Sand and gravel	Minor aquifer Variably Permeable
Pentre Uchaf	Bodfari	Flintshire	SJ 310850, 372050	Sand and gravel	Minor aquifer Variably Permeable
Parry's Quarry	Alltami	Flintshire	SJ 327570, 366465	Sandstone, clay and shale	Minor aquifer Variably Permeable
Pinfold Lane North	Alltami	Flintshire	SJ 327300, 366650	Sandstone, clay and shale	Minor aquifer Variably Permeable
Pinfold Lane South	Alltami	Flintshire	SJ 327120, 366210	Clay and shale	Minor aquifer Variably Permeable
Ballswood	Llay	Wrexham	SJ 335200, 356600	Sand and gravel	Major aquifer Highly Permeable
Llay main colliery tip	Llay	Wrexham	SJ 332480, 356150	Clay and shale	Minor aquifer Variably Permeable
Borras Quarry	Wrexham	Wrexham	SJ 336300, 352500	Sand and gravel	Minor aquifer Variably Permeable
Graig	Llanarmon -yn-lal	Denbighshire	SJ 320500, 356500	Limestone	Major aquifer Highly Permeable
Maes-y-droell	Graianrhyd	Denbighshire	SJ 321900, 356500	Silica sand	Minor aquifer Variably Permeable
Pant-y-Gwlanod	Eryrys	Denbighshire	SJ 320040, 357335	Limestone	Major aquifer Highly Permeable
Rhosesmor sand pit	Rhosesmor	Flintshire	SJ 32170, 36680	Sand and gravel	Minor aquifer Variably Permeable

The Environment Agency has published guidance on the locational aspects of landfills in planning consultations and permitting decisions (EA Regulatory Guidance Note 3 Version 4, December 2002). This document identifies that the EA will object to landfills of the type proposed where long term site management is essential to prevent long-term groundwater pollution in situations where the site lays over a Major Aquifer. In principal therefore it is expected that the EA would object to the siting of a landfill at Fron Haul, Halkyn, Hendre, Pant, Trimm Rock, Ballswood, Graig and Pant-y-Gwlanod. Those sites which are located in sand and gravel environments will not by virtue of geological conditions offer any degree of natural containment of leachate (Maes Mynan, Pentre Uchaf, Ballswood, Borras Quarry, Maes-y-droell, Rhosesmor). This means that from the

perspective of geological conditions and aquifer vulnerability the most appropriate sites are at Parry's Quarry, Pinfold Lane and Llay Main Colliery Tip. The Llay site lies within the Wrexham authority area and is thus discounted on locational grounds being outside the Flintshire boundary and remote from the main areas of waste generation within the County.

It is apparent that from the above that the preferred sites with respect to location, geological context and aquifer vulnerability status are Parry's Quarry and Pinfold Lane.

2.5 Design and Layout of Parry's Quarry Landfill Site

This section of the Environmental Statement should be read in conjunction with the Design Statement document prepared by AMEC E&E which accompanied the planning application. The design statement provides a more detailed technical description of the proposed project than that presented here which focuses upon providing a sufficient understanding of the proposals in order that the associated environmental impacts can be properly identified and assessed.

A range of scenarios have been considered with respect to the configuration and positioning of the landfill within the registered title boundary. These scenarios have taken into account the following factors;

- The requirement for site access for waste delivery vehicles onto the adjacent highway (Pinfold Lane).
- The space requirements for internal site access roads, screening bunds and other infrastructure.
- The requirement to retain the existing Site of Special Scientific Interest (SSSI)/Special Area of Conservation (SAC) within the site and the creation of new habitat adjacent to this in the south eastern quadrant of the site.
- The presence of the existing lagoon in the northern section of the site part of which will be retained for surface and leachate control.
- The presence of existing natural vegetation present along the western and eastern site boundaries which is to be retained to provide screening of views into the site.
- The requirement to maximise available landfill void space whilst restricting the ultimate height of the completed landfill to allow for final slope stability, adequate drainage of the landfill surface and the creation a landform which is acceptable in terms of visual impact.

The preferred option which will be adopted for the proposed project meets the requirements of all the above. The configuration of the landfill within the site and the current topography and finishing contours for the landfill are described in Appendix 2.3, Figures 1, 2 and 3.

It should be noted that the design of the landfill has been progressed by AMEC Earth and Environmental to a conceptual stage supported by sufficient engineering appraisal

to demonstrate that the proposals are robust in engineering terms. The detailed design of the site together with a working plan which describes the precise manner in which the site will be operated will be developed following receipt of planning consent. These items will form part of the Integrated Pollution Prevention and Control (IPPC) Permit which will need to be secured by the landfill operator prior to the implementation of the project. It is likely that the permitting process itself will take between 12 and 18 months to complete.

2.5.1 Design and Waste Capacity of Site

The proposed project will provide a total of approximately 2,600,000 cubic metres of landfill void space (see Table 2.4 below) with this volume including deposited waste and cover material (typically soils) which is required to be placed over the waste at the end of each working day during infilling. This volume has been calculated assuming that the landfill side slopes within the quarry void will be constructed at a grade of 2:1.

Table 2.4 Landfill void volumes

Waste Footprint/Buffer Zone Scenario	Available Total Site Volume (m³)	Volume Occupied by Final Cover – Assuming a 1.15m Depth (m³)	Volume Occupied by Leachate Collection System – Assuming a 0.5m Underdrain Depth (m³)	Volume Occupied by Sidewall Liner, if Required – Assuming a 3.0m Horizontal Thickness (m³)	Available Landfill Volume (Waste and Daily Cover Soil) (m³)
<i>Minimum 30 m Buffer Zone width with partial landfilling of the northwest dewatering pond; Footprint Area of 96,293 m²; Sidewall slopes at to 2:1</i>					
• Landfill Base @ 82 mAOD (+/- as peaked landfill base design) with 2:1 sidewalls	2,845,412	114,170	22,131	92,686	2,616,425

Tables 2.5 and 2.6 below illustrates the available landfill tonnage to be 1569855 tonnes assuming the void volume given above and a conservative (i.e. lower estimate) for emplaced waste density of 600 kg/m³. This equates to an annual waste input rate of 104657 tonnes assuming a lifetime for landfilling of 15 years or 78492 tonnes per annum for a project lifetime of 20 years. If a higher degree of compaction of the waste is achieved, then an in-situ waste density of 900 kg/m³ may be possible. This would equate to an annual input of 156,986 tonnes per year for a 15 year project lifetime or 117,729 tonnes/annum for a 20 year project lifetime.

Table 2.5 Available landfill tonnage assuming an in-place gross waste density of 600 kg/m³

Waste Footprint/Buffer Zone Scenario	Available Landfill Volume (Waste and Daily Cover Soil) (m3)	Available Landfill Tonnage (Waste) (tonnes) – Assuming In-Place Gross Refuse Density of 600 kg/m3	Waste Receipt Rate Corresponding to a 15 Year Site Life (tonnes/yr)	Waste Receipt Rate Corresponding to a 20 Year Site Life (tonnes/yr)
<i>Minimum 30 m Buffer Zone width with partial landfilling of the northwest dewatering pond; Footprint Area of 96,293 m2; Sidewall Slopes at 2:1</i>				
<ul style="list-style-type: none"> Landfill Base @ 82 mAOD (+/- as peaked landfill base design) with 2:1 sidewalls 	2,616,425	1,569,855	104,657	78,493

Table 2.6 Available landfill tonnage assuming an in-place gross waste density of 900 kg/m³

Waste Footprint/Buffer Zone Scenario	Available Landfill Volume (Waste and Daily Cover Soil) (m3)	Available Landfill Tonnage (Waste) (tonnes) – Assuming In-Place Gross Refuse Density of 900 kg/m3	Waste Receipt Rate Corresponding to a 15 Year Site Life (tonnes/yr)	Waste Receipt Rate Corresponding to a 20 Year Site Life (tonnes/yr)
<i>Minimum 30 m Buffer Zone width with partial landfilling of the northwest dewatering pond; Footprint Area of 96,293 m2; Sidewall slopes at 2:1</i>				
<ul style="list-style-type: none"> Landfill Base @ 82 mAOD (+/- as peaked landfill base design) with 2:1 sidewalls 	2,616,425	2,354,783	156,986	117,739

Given that the waste input to the A D Waste site at Brookhill has been approximately 1 million tonnes over the years 2001-2006, an annual waste availability of circa 200,000 tonnes per annum from within Flintshire would appear to be a robust assumption. This suggests that if the proposed project attracts only approximately half of this figure (i.e. 100,000 tonnes), that the project lifetime in terms of utilising the available void space for filling will be a maximum of circa 15 years assuming a waste density of 600 kg/m³ or a maximum of 20 years assuming a waste density of 900 kg/m³.

Based upon the projected waste volumes provided by Enviro for 2009/10, almost the entire annual waste inventory of 100,000 tonnes could be provided by Flintshire's MSW arisings if recycling targets are not met. In the event that such targets are achieved then

approximately two thirds (circa 66,000 tonnes) of the conservative estimate of annual waste input for a 15 year project lifetime (100,000 tonnes per annum) could be provided by Flintshire's MSW arisings alone.

2.5.2 Configuration of landfill and initial site preparation phase

(a) Buffer Zone

The positioning of the landfill within the site allows for the retention of a minimum 30m buffer zone around the maximum aerial extent of the landfill footprint relative to the perimeter boundaries of the site (see Appendix 2.3 Figure 3). This ensures that all the existing mature vegetation on the western and eastern boundaries of the site can be retained and further that the existing SSSI is left undisturbed and additional space is available for further habitat creation in the south eastern quadrant of the site.

(b) Site Access

In order to provide safe and adequate access for waste delivery vehicles using the site improvements to the current site access onto Pinfold Lane will be required. The traffic engineers for the project (Veryards Opus Ltd) have determined the need for a filter lane to be constructed to prevent vehicles leaving the site causing a back up of traffic on Pinfold Lane when the lights at the end of the lane at the cross roads with Mold Road (A494) are on red. The filter can be provided using land within the registered title boundary and will be constructed at the cost of the landfill operator. Proposed site access details are illustrated in Figure 2.2.

(c) Finished Elevation

The figure presented as Appendix 2.3, Figure 8 illustrates sections across the landfill that demonstrate existing site contours (as at April 2006) relative to the proposed final landfill landform once all waste and final cover has been placed. Note that the maximum height of the completed landfill will be 129m AOD (Appendix 2.3 Figure 3) with slopes at 20:1 near the crest and 4:1 on the flanks of the landfill. The final contours do not take account of settlement that will take place over time as the wastes further compact under their own weight and as the biodegradable component breaks down. The maximum height of the landfill will therefore not exceed that shown in Appendix 2.3, Figure 3.

(d) Phasing of Landfilling Operations

It is proposed that landfilling activities will progress in parallel with continuing mineral extraction. As a result, a phased approach to landfilling in a series of 4 No. cells is proposed to allow for operational flexibility. The proposed sequence of cell construction and filling is illustrated in Figures 6 and 7 of Appendix 2.3.

Figure 8 in Appendix 2.3 shows that earthworks will have to be performed to prepare the base and sidewalls of the landfill to allow for both the construction of the four cells within

the quarry void into which waste will be deposited and to facilitate the construction of the basal landfill leachate collection system. The base of the landfill is proposed to be at an elevation of circa 82.0m AOD and will be profiled in a manner that facilitates falls (typically 2% basal slopes) to the periphery of the landfill footprints to allow leachate to drain to the perimeter collection system. Excavations to prepare the landfill base for filling will take place sequentially in each of the four cells. Preparation works in each of the four cells will be of a very similar nature with the amount of earthworks required dependent upon the stage to which mineral extraction has progressed at the relevant time.

Site preparation works will first be carried out within Cell 1 in the north eastern quadrant of the landfill. The works shall comprise excavation to the proposed landfill base contour and shaping of the sidewalls. Currently it is proposed that the eastern flank of the cell will be constructed with a sidewall grade of 2:1. The walls at the western and southern flanks will be constructed at a grade of 2:1. The western and southern walls will ensure that surface water, i.e. precipitation, falling on Cell 1 during filling is contained within that cell area.

(e) Dewatering and Cell Lining

The base of the landfill will extend into the groundwater table by up to approximately 10 metres. As a result, dewatering will be required in order to allow the basal and lower parts of the sidewall liner system to be constructed. Dewatering will continue to be required until such time as a sufficient depth of waste has been placed to prevent basal or lateral heave of the liner. Dewatering will likely require the installation of groundwater abstraction boreholes to depress the water table in addition to localised pumping from sumps. Dewatering water will be pumped to the lagoon in the north west corner of the site and from there via the existing outfall arrangements for quarrying dewatering water to Alltami Brook.

Once the walls and base have been constructed, the basal clay liner, geomembrane liner and non woven geotextile will be placed. The purpose of the liner is to facilitate full containment of the waste and of leachate and landfill gas which will be generated from it after its deposition. The geotextile is required to protect the geomembrane from mechanical damage such as puncture or ripping. In accordance with standard requirements at landfill facilities both the liner and geotextile will be installed by a specialist contractor adhering to strict Quality Assurance/Quality Control (QA/QC) protocols which have been developed by the Environment Agency. The QA/QC protocols necessitate a very high standard of installation and provision of evidence that, for example, joins in the liner have been properly sealed to make them water and gas tight. Third party verification of successful installation will also be provided.

(f) Initial Leachate and Surface Water Collection and Management

The liner and geotextile will be overlain by a layer of crushed stone, typically 500mm in thickness, that will allow leachate to be collected from the base of the waste deposit.

Leachate management will be enhanced by the laying of a herringbone pattern of leachate collection pipes that will assist in ensuring that leachate is diverted to the south east corner of Cell 1 where a leachate pumping station (Leachate Pump Station No. 1) will be constructed.

The leachate collection system for Cell 1 will be connected to the foul sewer system external to the site through the construction of a subsurface leachate forcemain (see Appendix 2.3 Figure 6 – Sequence No. 1). The complete leachate system for the whole site is presented in Appendix 2.3 Figure 4.

In addition to the works required to prepare Cell 1 for filling, sufficient earthworks will take place within the areas of future landfill Cells 2,3 and 4 to ensure that surface water from these areas is effectively directed to the existing dewatering pond which serves the current mineral extraction operations in the north west corner of the site.

(g) Site Screening

The initial site preparation works will also include the construction of a 4m high fence to be constructed from closed timber boarding adjacent to the northern site boundary which shall assist in visually screening off-site receptors located to the north from landfill operations. It will also reduce the risk that wind blown litter from waste deposition activities will be transported beyond the site boundary to the north and will provide an additional barrier for the transport of dust off-site. The extent of the fence is shown in Appendix 2.3 Figure 3. Visual screening provided by the fence will be augmented by planting to soften the appearance of the fence itself. Additionally, any gaps in existing vegetation screens around the eastern and western boundaries of the site will be filled with suitable evergreen native planting.

(h) Site Access

Site preparation works will also include the construction of enhanced access for waste delivery vehicles and other site traffic onto Pinfold Lane. An internal access road shall be constructed to extend at or near to existing grade from this new access point around the southern and eastern flanks of the landfill footprint, terminating at the northern extremity of Cell 1 (see Appendix 2.3 Figure 6 – Sequence No. 1). This access road shall be provided with a hard metalled surface (probably tarmac) to ensure its integrity throughout the operational phase of the project. The provision of a metalled road will allow minimise the potential for erosion by vehicle traffic and also ensure that a high standard of cleanliness can be maintained on internal haulage routes through the use of road sweeping plant that will periodically remove mud and dirt from the road surface. It will also assist in minimising the potential for mud and dirt to be transferred off-site by waste delivery vehicles.

(i) Other Site Infrastructure

The final stage of site preparation works will involve the establishment of other site infrastructure required to facilitate and manage landfill operations. This shall include the use of the existing weighbridge, waste reception office (positioned adjacent to the weighbridge) a separate administration office and welfare facilities (toilets and messing facilities) for site staff. Note that there are already a number of portakabin type buildings on-site which serve the existing minerals extraction operations and it is probable that these will prove suitable for adaptation for housing the administration and welfare functions for landfill operations.

(j) Required Plant

The requirements for plant and equipment to be utilised in the initial site preparation phase will be limited. For the earthworks and construction activities required for the preparation of Cell 1 plant is likely to be limited to 2 No. 360⁰ excavators, a bulldozer a dump truck and a roller. Similar plant will be utilised for construction of the internal access road and new external access. The laying of tarmac surfacing will require the use of specialist asphaltting plant. Note that these plant requirements are assumed to be additional to the earthmoving plant currently involved in mineral extraction operations.

h) Duration of Site Preparation Phase

The site preparation phase will require a period of approximately 12 months in total although a majority of the works described above will be undertaken within the optimum construction field season i.e. between March/April and September/October when drier conditions for earthworks are expected.

2.3.3 Operational and Ongoing Construction Phase

(a) On-site Vehicle Routing

Once the preparatory works described above have been completed, waste input will commence with deposition occurring within Cell 1. Waste delivery vehicles will access the site via the newly provided access point off Pinfold Lane and proceed to the waste reception office and weighbridge where the vehicle will be weighed and waste transfer documentation inspected to verify the source and composition of the waste material. On acceptance the waste delivery vehicle will travel along the internal access road and proceed down into the cell void to deposit the waste by end tipping from the vehicle at a point specified by the landfill operator. As waste accumulates at the tipping face in this fashion, material will be graded out using a bulldozer and compacted by traversing over it using a compactor fitted with specially adapted wheels.

(b) Phased Infilling of Cells

Filling within Cell 1 shall continue until such time as wastes have accumulated to an elevation which approximates to that of the existing ground profile around the quarry void i.e. to a minimum elevation of approximately 105m AOD at the northern tip of Cell 1 to a maximum of 112m AOD at the south western corner of the cell. This shall be the interim stage of filling within the cell until such time as the remaining three cells (Cells 2-4) have been progressed to the same stage. The interim surface profile of Cell 1 will be at a grade of 20:1. The interim cover over the wastes will be provided progressively as waste deposits accumulate. Specifically the cover will be placed once the wastes in each area of Cell 1 have been in-situ for circa 90 days. Before the waste has been placed to the interim level in Cell 1, a perimeter ditch will be constructed around this part of the landfill footprint in order to intercept any surface water which may run-off the interim cover layer.

As waste placement to its interim level in Cell 1 is taking place, preparation of Cell 2 for filling will be undertaken in the same manner as described above and as illustrated in Appendix 2.3 Figure 6 – Sequence No. 2. Filling will also take place in the same sequence.

Cell 3 preparation and filling will follow as for Cells 1 and 2. with the necessary extensions to the leachate, landfill gas and surface water management systems.

Preparatory works for Cell 4 shall include the construction of an external retaining wall for the south western quadrant of the landfill to ensure full enclosure of the landfill void. These works will require the placement of selected fill materials to a detailed engineering specification. The construction of the retaining wall will cut across the dewatering pond in the north western corner of the site and shall necessitate the removal of water by overpumping from the void space which is created internally. Cell preparation works will then progress in accordance with the procedures previously applied to Cells 1-3. The internal access road and perimeter ditch to intercept surface water shall be extended to fully encircle the footprint of the landfill and the basal leachate collection system shall be completed.

Cell 4 will be filled from its base to final height above in a single operation in order to minimise the period over which landfilling operations are visible from receptors to the north (principally residents at Northop Hall village). The waste placed within Cell 4 will be placed to a height and profile that allows the placement of the final capping layer and restoration soils. Landfilling to final height will then progress within Cell 1 through the initial removal of the interim cover placed over the waste to an extent which allows hydraulic connection between the wastes which have already been deposited and the waste which shall be placed to bring filling in the cell to completion. In particular, vertical leachate migration pathways through the waste to the collection system at the landfill base will need to be established by the removal of the interim cover.

Once Cell 1 has been completed, visual screening of landfill operations will be achieved for subsequent landfilling activities to be undertaken in the same manner within Cell 2 and finally Cell 3.

The landfill gas collection system shall be extended as waste thickness increases in each of the cells.

Given a projected landfilling lifetime of 15 years, each cell will take approximately 20 months to fill up to existing grade and a further 20 months to fill above grade up to final height. Thus the maximum period over which landfilling operations within Cells 1 and 4 will be visible from receptors located to the north will be approximately 40 months. Note that progressive placement of the final cap and cover soils followed by vegetation establishment will take place progressively over this period.

(c) Landfill Gas Management

Landfill gas is generated as a result of the decomposition of the organic component of the waste deposited within a landfill site. Decomposition occurs as a result of micro-organisms utilising the organic material as a food source. These micro-organisms generate bi-products resulting from the breakdown of the waste and the gaseous products predominantly comprise methane (a colourless, odourless and potentially flammable and explosive gas) and carbon dioxide (a colourless and potentially asphyxiating gas). There are approximately 500 other constituents of landfill gas but these typically comprise no more than 1% of the total volume of gas produced.

The conceptual design of the landfill includes measures (i.e. the clay and geomembrane liner on the base and side of the landfill void below grade and the impermeable cap over the waste above grade) which will ensure that any gas which is produced is contained within the waste mass where it can be effectively collected and subsequently managed in an appropriate manner.

The management of LFG in is covered by three European Directives viz:

- Waste Framework Directive (75/442/EEC as amended);
- Landfill Directive (1999/31/EC); and
- Integrated Pollution Prevention and Control (IPPC) Directive (96/61/EC).

In England and Wales, these directives are implemented by the Landfill Regulations 2002 and the Pollution Prevention and Control Regulations 2000, both of which were made under the Pollution Prevention and Control (PPC) Act 1999.

The Landfill Directive intimates that measures should be taken to reduce production of LFG, to reduce global warming, through the reduction of biodegradable waste and requirements to introduce LFG control, preferably by collection and burning in flares or energy recovery plants. :

- Appropriate measures shall be taken in order to control the accumulation and migration of landfill gas;
- Landfill gas shall be collected from all landfill receiving biodegradable waste and the landfill gas must be treated and used.
- Landfill gas which cannot be used to produce energy must be flared.
- The collection, treatment and use of landfill gas under paragraph shall be carried on in a manner which minimises damage to or deterioration of the environment and risk to human health.

The Conceptual Gas Management Plan was in accordance with “*Guidance on the management of landfill gas*”, Environment Agency, September 2004.

The Environment Agency’s strategy for the future of LFG management is to improve the performance and regulation of LFG management:

- Operators must develop a site-specific Gas Management Plan that will be reviewed annually and revised in the light of updates of risk assessment and recent monitoring data;
- Emissions monitoring from LFG flares, engines and landfill surfaces and assessed against emissions standards; and
- Regular site inspections and use of detailed audits.

The following Conceptual Gas Management Plan describes the conceptual landfill gas (LFG) management plan to be implemented at the proposed Parry’s Quarry landfill (Site). The design is based on the current regulatory framework, site setting, preferred approaches and ease of progressive construction during active landfilling. The conceptual gas management design should seamlessly blend into the overall landfill design and construction.

Collecting and destroying landfill gas (LFG) reduces methane emissions to the atmosphere and reduces local safety hazards from the potential build up and explosion of methane. It also reduces odours associated with landfill sites. The main impetus for developing LFG utilisation is increasingly being driven by environmental legislation and as such is not seen as a great barrier to landfill development.

With the proposed landfilling of biodegradable waste at the Site LFG generation is expected through the decomposition of organic materials. The first phase of decomposition takes place in the first year of landfilling and the majority of LFG is generated within the first 20 years of landfilling, although emissions generally continue for over 100 years. Therefore the regulatory framework requires the progressive installation and operation of a gas management system.

The following describes the design criteria for the conceptual gas management system:

- Seamless integration into the overall site design, construction and operation, including engineered liner of the base and sides and engineered capping;

- Follow the logical site sequence (Cell 1 to 4);
- Use of horizontal extraction trenches progressively installed as landfilling progresses;
- Use of laterals to connect the trenches to the system;
- Use of a ring header system to provide redundancy to the collection system, therefore increasing system efficiency;
- Upon placement of final cover, implement the horizontal trenches with vertical extraction wells in the centre of the Site;
- Connect the leachate collection system to the LFG collection system to relieve gas pressure and methane build-up;
- Provide condensate management at system low points, drain or pump condensate into the leachate collection system;
- Stage progressive blower installation to accommodate the increasing gas generation;
- Stage flare and utilisation installation to accommodate the increasing gas generation;
- Minimise overall risk to the environment.

The EA document "*Guidance on the management of landfill gas*" outlines several criteria for the gas management system design:

- Achieve 85% gas collection efficiency;
- Initiate gas recovery once the gas flow reaches 50 to 100 m³/hr. This criteria may be reviewed and discussed with the Environment Agency based on the potential risk;
- Gas utilisation is required if 0.75 MW of power may be produced from the collected LFG.

A number of factors including waste composition, moisture content, temperature, availability of nutrients, pH, etc influence the production of LFG. LFG is primarily composed of two major gases: methane (CH₄) and carbon dioxide (CO₂). Other components of lesser quantity include nitrogen (N₂), oxygen (O₂), and odorous compounds. VOCs are also found in LFG at low or trace concentrations, usually at parts per million or parts per billion level. Methane is explosive in concentrations ranging between 5 and 15 percent by volume in air.

LFG Generation Model

A number of models are available for estimating LFG production. Accepted industry standard models are generally first order kinetic models that rely on a number of basic assumptions regarding site-specific conditions. These models are used to predict the variation of LFG generation rates with time for a typical unit mass of solid waste. This LFG generation rate curve is then applied to projections of solid waste filling at the site to produce an estimate of the LFG production over time.

The Scholl Canyon model is a first order kinetic model which uses site-specific landfilling history/projections together with some predefined default input parameters to estimate LFG production. The Scholl Canyon model is used to estimate LFG production over time as a function of the methane generation constant (k), the methane generation

potential (L_0), historic filling records, and projections of waste filling. The following briefly describes each of these input parameters:

Methane Generation Rate (k)

The methane generation rate constant (k) represents the first order rate at which methane is generated following landfilling. The constant is influenced by:

- moisture content;
- availability of nutrients;
- pH; and
- temperature.

The moisture within a landfill is considered to be one of the most important parameters controlling gas generation rates. Moisture provides the aqueous environment necessary for gas production and also serves as a medium for transporting nutrients and bacteria. The moisture content in the landfill is strongly influenced by climatic conditions (temperature, rainfall, etc.), initial moisture content of the landfilled waste and specific landfill design features such as type of base liner, type of leachate collection, type of cover and programs such as rapid stabilisation. These factors influencing the generation rate are largely controlled by the local climatic conditions; therefore the default value for k varies from region to region. Typically, k values range from 0.02/year for dry sites to 0.07/year for wet sites.

Methane Generation Potential (L_0)

The generation potential is the total yield of methane produced by a unit mass of waste. The generation potential is largely dependent on the waste composition, specifically the percentage of organic matter in the landfilled waste. Production of LFG may continue for more than 50 years after site closure, and can result in total yields of LFG in the range of 125 m³ of CH₄ per/tonne of waste up to 310 m³ of CH₄ per/tonne of waste (45 to 111 kg CH₄/tonne of waste at 50% CH₄).

Waste Generation

The amount of waste landfilled annually is a primary factor in estimating LFG generation.

Estimated LFG Generation Potential

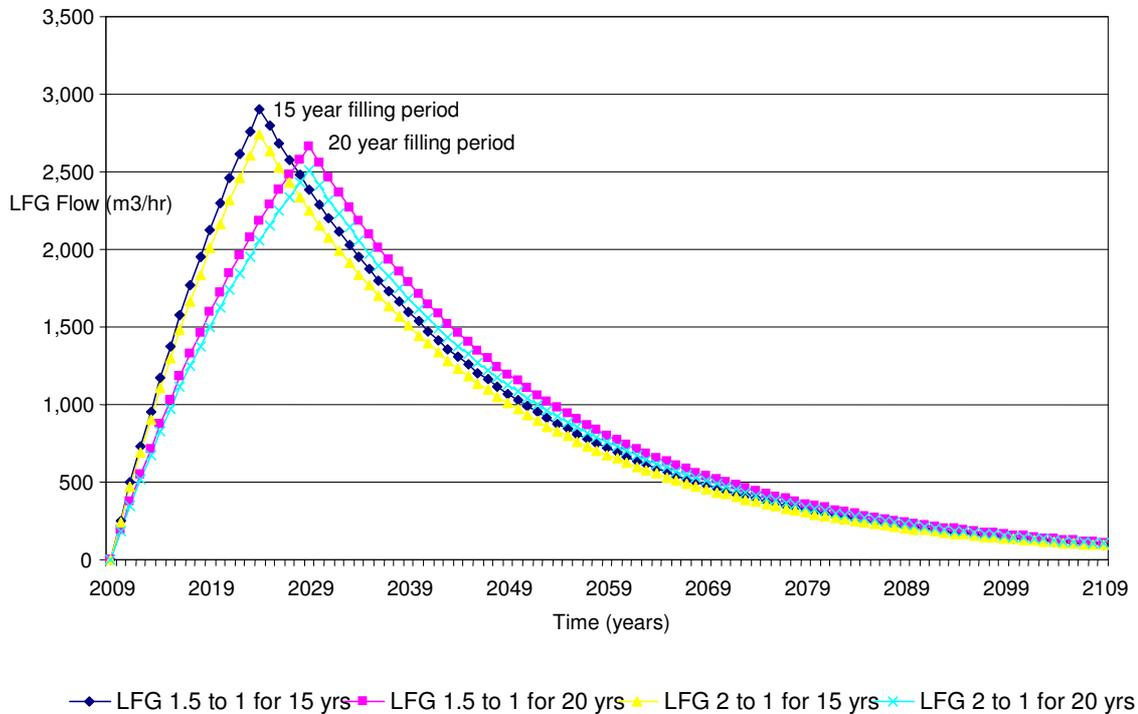
The LFG generation potential is site-specific and is subject to some uncontrollable factors; therefore it is difficult to accurately predict the rate of LFG generation. In addition at this preliminary stage of conceptual design for this site a number of factors are unknown.

Assuming the following waste generation scenarios and a LFG generation potential of 250 m³ of CH₄ per/tonne of waste and a methane generation rate of 0.04/year:

Scenario	Site Life (years)	Annual Tonnage (tonnes)
Sideslope 2 : 1	15	104,657
Sideslope 2 : 1	20	78,493

The following graph indicates the estimated LFG generation potential for the above scenarios:

Landfill Gas Generation Potential



Waste will accumulate in the manner described above within Cell 1 until sufficient waste has been deposited to justify the commencement of the installation of the landfill gas collection system for the site. Landfill gas generated from the decomposing biodegradable wastes will be collected via a series of horizontal and lateral trenches. These will be positioned at a minimum of three levels (i.e. lower, upper and middle) as waste is progressively deposited to allow gas to be collected from the entire waste mass (see Figure 5 Appendix 2.3). The horizontal trenches consist of a segmented perforated HDPE pipe in gravel bedding, placed in a trench in the refuse. The pipe segments use a 6" solid HDPE pipe and an 8" perforated HDPE pipe with the segments overlapping. This segmented approach provides additional flexibility for the waste movement and

settlement over time. The low level horizontal trenches should be installed at least 6 metres above the base to avoid potential flooding by mounded leachate.

The trenches will be spaced 10 metres vertically and 40 metres horizontally to achieve an optimal zone of influence over the entire waste mass, therefore achieving the 85% collection efficiency. A 4 to 6 metre waste depth will be maintained over the expected capture zone of the trench prior to initiating LFG extraction to prevent air intrusion into the system. The pipe material selection for the wells may be 4" to 6" PVC or HDPE.

Vertical extraction wells will be added over finished surfaces of the Site to enhance LFG capture. Extraction wells should be installed between the horizontal trenches within the 127 mAOD contour area at 40 metre spacing. The wells will be designed to accommodate the extreme settlement expected at a landfill.

These horizontal trenches and vertical wells will be equipped with valves and monitoring ports to allow monitoring of gas concentrations, temperature, flow and pressure.

For the collection of gas from the horizontal and vertical trenches, a ring-header system is proposed outside the limit of waste, below the depth of frost, to provide the flexibility for gas to be drawn from either side of the header. The header will be constructed of 450mm diameter solid High Density Polyethylene (HDPE). Valves will be installed at the points where the trenches connect with the peripheral header pipe to allow control of gas flows and gas pressure from within all areas of the waste mass (Figure 5 Appendix 2.3). This provides redundancy if part of the header must be shut-off for maintenance, therefore minimising down time. The header will be equipped with valves to allow isolation of portions of the header as required. A valve and monitoring chamber will be installed at the connection of laterals to the header to improve localised gas control as indicated on Appendix 2.3 Figure 5.

In addition to the construction of the gas header pipe, a landfill gas condensate forcemain will also be constructed around the north eastern perimeter of the landfill i.e. around the eastern edge of Cell 1. Landfill gas will be moist and this moisture will condense within the gas collection system and accumulate reducing the efficiency of gas capture unless a mechanism is available to control it. The condensate forcemain will collect condensate from the landfill gas header pipe at the lowest elevation of the landfill (i.e. the extreme northern tip) and the condensate will then be pumped to leachate pump station No. 1 and then ultimately to foul sewer for disposal (Figure 5 Appendix 2.3).

Landfill gas utilisation and destruction plant

During the filling of Cell 1, landfill gas management plant will be constructed on site to deal with landfill gas generated from the deposited waste. The plant will be situated in a secure compound surrounded by palisade fencing provided with a lockable gated access and located as shown in Appendix 2.3 Figure 5, The plant shall incorporate piping and valves and an overall system control, a condensate trap, moisture separator, landfill gas extraction blowers, a maximum of 3 No. landfill gas utilisation engines and closed flare.

Typically landfill gas collection commences when approximately 10m depth of waste has been deposited although this varies on a site specific basis. Initially the quality and quantity of gas which is collected is likely to be insufficient to support efficient combustion as a fuel supply for gas driven engines which will be utilised to generate electrical power. During this initial stage collected gas will be flared and the combustion products emitted to atmosphere.

The following table (Table 2.7) indicates the potential system start-ups as per EA Guidance requirements:

Table 2.7 Potential Landfill Gas System Start-up

<i>Sideslope Scenario</i>	<i>Site Life (years)</i>	<i>Annual Tonnage (tonnes)</i>	<i>Approx. Peak Gas Flow (m3/hr)</i>	<i>Timing of Gas Control Start-up (years after opening)</i> ¹	<i>Approx. Peak Utilization (MW)</i> ²		<i>Timing of Gas Utilisation Start-up (years after opening)</i> ³	
2 : 1	15	104,657	1,792	0.8	2.0	2.5	3.8	4.7
2 : 1	20	78,493	1,792	1.1	2.0	2.5	5.0	6.3

Notes:
 1 - assuming a trigger value of 100 m3/hr gas flow to initiate gas control
 2 - assuming 85 % collection efficiency and 600 - 750 m3/hour (at 50% methane) required to generate 1 MW
 3 - assuming a trigger of 0.75 MW to initiate utilization

If a trigger value of 100 m3/hr is assumed, LFG collection should be initiated approximately 1 year following initial waste deposition in Cell 1. This may be difficult to achieve, hence all the facilities will be built for the expected peak rate is approximately 1,900 m3/hr. A staged approach will be used to allow flexibility for adding LFG extraction capacity. A risk assessment will be performed to demonstrate the low risks associated with delaying LFG extraction until additional capacity may be added, that would be a more realistic foundation for the final LFG management plan. If this trigger is assumed, LFG extraction must continue for over 100 years as indicated on the LFG generation curves.

Once gas quality and quantity have reached a sufficient level it will be utilised to drive the engines which will produce electricity that can either be utilised by local land users or routed to the national electricity grid.

Assuming a trigger of 0.75 MW to initiate gas utilization, 3.6 to 5 years is required for enough waste to accumulate to generate the required LFG.

Eventually the quality and quantity of gas being generated from the wastes will decline and flaring will again be required until such time as the site is no longer producing gas at a level which can support combustion (circa 100 years).

(d) Leachate management

Landfill leachate is a liquid generated as result of the percolation of water (principally rainwater) through the waste mass during its deposition and also as a result of moisture being squeezed out of the waste mass under compression after deposition. Landfill leachate contains elevated levels of nutrients (nitrogen and phosphorous compounds) resulting from contact with degrading organic materials. It may also contain other substances that can be toxic or harmful if untreated leachate is released into the aquatic environment.

As with landfill gas, the conceptual design for the site will ensure full contain of leachate within the body of the landfill. The basal collection system installed during the preparation of each landfill cell will enable leachate percolating through the waste to be collected.

In order to estimate leachate production from the landfill, the HELP (Hydrologic Evaluation of Landfill Performance) Model, Version 3.07 (1997) was used to estimate infiltration rates through the four proposed landfill cells under the following operating conditions:

- Open landfill cell immediately after construction with no waste;
- Open landfill cell with an interim cover soil layer; and
- Closed landfill cell with a low permeable soil (clay) and vegetated top soil final cover system.

This model is frequently used to assess the performance of landfill covers and other containment systems. Five years (2001-2005) of daily precipitation, solar radiation and temperature data from the weather station at Hawarden Airport (published by the Meteorological Office) were used to develop data for specific use to estimate infiltration rates and assess associated potential leachate generation.

The HELP model also requires data inputs relating to the physical characteristics of the interim cover soil layer and final cover soil layer proposed for the Parry's Quarry landfill. Table 2.8 presents a summary of the input data used to estimate the physical characteristics of these cover soil materials.

Table 2.8 HELP Model Inputs – Physical characteristics of cover material

Layer Type	Thickness	Porosity	Field capacity	Wilting Point	Saturated Hydraulic Conductivity
	cm	%	%	%	cm/sec
Interim Condition-Interim Cover Soil Layer	30	46	38	13	0.15
Post Development Condition (Final Cover)	15	43.7	10	5	0.0058
	100	36.5	30.5		

The results of the HELP model analysis are presented in Table 2.9

Table 2.9 Help Model Results

	Open Cell	Interim Cover	Final Cover
Infiltration (mm/year)	668	350	182

Table 2.9 indicates a rate of stormwater infiltration for an open cell as being approximately 668 mm/year, and 350 mm/year through a cell completed with interim cover soil overlaying waste. The estimated rate of infiltration through a completed cell having final cover soil with established vegetation over the waste is approximately 182 mm/year. Thus the application of the final cover system will reduce stormwater infiltration by approximately 486 mm/year (73%) and 168 mm/year (48%), from that of an open cell or cell completed with interim cover.

Thus, the estimated reduction in the infiltration rate with the progressive application of a vegetative final cover system will result in a significant reduction in the amount of leachate that is generated by the landfill during its development.

The progressive application of the final cover system will be performed in stages throughout the active life of the landfill. Under the proposed sequential landfill development, each cell will have three phases such as open void, interim cover and final cover stages. To estimate the amount of leachate generated from the cells for each sequence, Table 2.10 was prepared to summarise the open or cover soil conditions pertaining to all 9 sequences of the four proposed landfill cells.

Table 2.10 Sequence of Development and Leachate Generation					
Sequence -1*					
	Cell	Area (m ²)	Open	Interim	Final
	1	25178	√	x	x
	2	21734	x	x	x
	3	29011	x	x	x
	4	20370	x	x	x
Sequence -2					
	Cell	Area (m ²)	Open	Interim	Final
	1	25178	√/2	√/2	x
	2	21734	√	x	x
	3	29011	x	x	x
	4	20370	x	x	x
Sequence -3					
	Cell	Area (m ²)	Open	Interim	Final
	1	25178	√/2	√/2	x

	2	21734	√/2	√/2	x
	3	29011	√	x	x
	4	20370	x	x	x
Sequence -4					
	Cell	Area (m ²)	Open	Interim	Final
	1	25178	√/2	√/2	x
	2	21734	√/2	√/2	x
	3	29011	√/2	√/2	x
	4	20370	√	x	x
Sequence -5					
	Cell	Area (m ²)	Open	Interim	Final
	1	25178	x	√	x
	2	21734	x	√	x
	3	29011	x	√	x
	4	20370	x	√	x
Sequence -6					
	Cell	Area (m ²)	Open	Interim	Final
	1	25178	x	√	x
	2	21734	x	√	x
	3	29011	x	√	x
	4	20370	x	√/2	√/2
Sequence -7					
	Cell	Area (m ²)	Open	Interim	Final
	1	25178	x	√/2	√/2
	2	21734	x	√	x
	3	29011	x	√	x
	4	20370	x	√/2	√/2
Sequence -8					
	Cell	Area (m ²)	Open	Interim	Final
	1	25178	x	√/2	√/2
	2	21734	x	√/2	√/2
	3	29011	x	√	x
	4	20370	x	√/2	√/2
Sequence -9					
	Cell	Area (m ²)	Open	Interim	Final
	1	25178	x	x	√
	2	21734	x	x	√
	3	29011	x	x	√
	4	20370	x	x	√

Note:

- √ - Indicates fully open, interim cover or final cover stages for a particular cell
- √/2 - Indicates partial open, interim cover or final cover stages for a particular cell.
- x - Indicates no-activity stage for runoff/leachate generation for a particular cell

Potential Leachate Generation

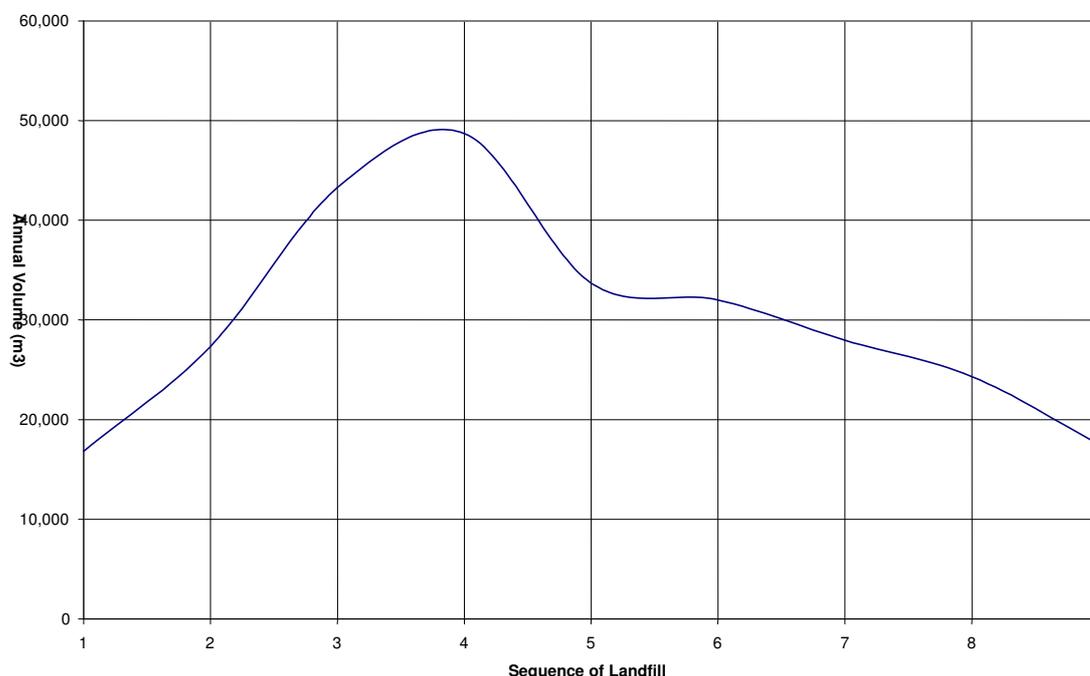
Based on the above-noted landfill development sequencing plan, Table 2.11 provides estimates of the annual amount of leachate that may be potentially generated during development and post-closure stages of the landfill.

Table 2.11 Estimates of annual amount of leachate generated

Development Sequence (as shown in Drawing No.7 & 8)	Annual Leachate Generation Volume (m3)	Average Daily Leachate Generation Rate (m3/day)
1	16,819	46
2	27,334	75
3	43,258	119
4	48,709	134
5	33,703	92
6	31,991	88
7	27,964	77
8	24,320	67
9	17,525	48

The above table indicates that the annual leachate peak generation will occur during development sequence four. At that time the peak leachate generation rate is estimated to be an average of 134 m³/day (1.5 litres per second). The annual leachate generation rate will attain a steady state at the end of full closure of the landfill. When the landfill is fully developed (post closure), the long term steady state leachate generation rate is estimated to be an average of 48 m³/day (0.6 litres per second). The graph below provides a depiction of the potential leachate generation over time during development of the proposed Parry's Quarry landfill to closure.

Annual Leachate Generation



Leachate collected at the bottom of the waste by the basal leachate collection system will be extracted by pumping from a series of chambers to the leachate forcemain which surrounds the perimeter of the waste body. From the forcemain a pipeline connection will be provided to the foul sewer which runs subsurface along the adjacent A494. Consent to discharge will be subject to the approval of Welsh Water. It is possible that some pre-treatment will be required prior to discharge. Typically this involves removal of some or all of methane dissolved in the leachate, a reduction in oxygen demand which results from the organic loading present and a reduction in ammonia and sulphide levels.

The technology required to achieve the above is now very well understood and has been implemented successfully on numerous landfill sites throughout the UK. Very significant improvement in leachate quality with respect to all the variables identified above can be achieved through leachate aeration.

(e) Site operations and waste disposal practice

All Site operations will be carried out in accordance with a "good neighbors" policy. Ongoing efforts to mitigate the impacts of potential nuisance factors such as dust, litter, noise and odour will be carried out in the spirit of this policy and in accordance with the protocols discussed in the following sections.

Supervision

The landfill site operator will maintain adequate manpower and equipment to carry out the daily landfill works in accordance with applicable legislation, the IPPC landfill permit and the approved Design and Operations (D&O) Plan.

The manpower required for site supervision will consist of dedicated landfill employees (waste reception/weighbridge office attendant and landfill operators). These employees

will be present at the site at all times during operating hours. The waste reception/weighbridge office attendant will be responsible for maintaining site security, controlling site access, accepting and recording waste loads, collecting tipping fees and directing incoming waste loads to the appropriate disposal area. In general, the responsibilities of the landfill operators will be to ensure deposition of waste in the designated disposal area, place and compact waste, place daily/interim cover soil, and ensure deposition of recyclable items and recoverable materials in the special disposal areas. The landfill operators will be also responsible for maintaining environmental controls including dust, litter, noise and odour control measures.

The site operator will ensure that all landfill employees are adequately trained with respect to the legal and technical requirements for operation of the landfill, in accordance with applicable legislation, the IPPC landfill permit and the approved D&O Plan. Note that as a minimum, an individual will need to be present on-site at all times who carries the appropriate Certificate of Technical Competence (COTC) for landfill site management.

Hours of Operation

It is envisaged at this time that the site will operate from 8:30 a.m. to 5:00 p.m. Monday to Saturday. The site will be closed on Sundays and Statutory Holidays.

These hours of operation may be maintained for long-term operation of the site. Equipment may operate at the site up to 1 hour before and no later than 2 hours after the hours of operation to complete the required maintenance and cover soil placement activities.

Site Access and Security

Access to the Site will be controlled via the main entrance gate off Pinfold Lane. The main entrance gate will be locked outside normal operating hours to prohibit vehicle entrance, pedestrian access and uncontrolled disposal when the site is closed.

The perimeter boundaries of the site will be screened by the existing tree line and/or fenced. An employee will maintain site security and ensure that all persons entering the site are authorised to do so. Landfill personnel will monitor the perimeter site boundaries on a daily basis with respect to unauthorised entry and uncontrolled disposal.

Inspection and Record Keeping

Daily site inspections against a specific checklist of items will be conducted by landfill personnel to verify that potential nuisance associated with housekeeping procedures, such as dust, litter and odour, are under control. Records of observations made during the site inspections and all regular housekeeping activities carried out will also be maintained.

All materials entering the site (i.e., waste and clean/inert fill) will be recorded as to the number of daily loads and type, source and quantity/weight of each load. Corresponding records for recyclable/reusable materials received at and removed from the site will also be maintained.

All records mentioned above will be maintained on site and retained at the legal address of the site owner, for a minimum of three (3) years, and made available for review upon request by the Environment Agency.

Waste and Cover Soil Placement

Waste will be placed utilising the area method in which the waste will be filled and compacted on previously filled areas or the prepared base, where applicable, and covered with daily cover soil at the end of each working day. The size of the active disposal area will be limited to no greater than 900 m² at any one time.

Waste will be placed in lifts of approximately 1.0 m depth along with the placement of daily cover soil. To the extent practical, the initial lift of waste placed over the basal leachate collection system (LCS) will consist of selected waste, primarily consisting of domestic waste having a minimum of fines and soil and will be a minimum thickness of 2.0 m prior to placement of a daily cover layer. The initial lift of waste will provide a relatively high permeability waste layer directly over the LCS. This placement methodology will help prevent fines (soil particles) from migrating into the LCS, contributing to the clogging of the LCS and potentially resulting in a perched leachate mound within the waste.

Daily Cover Soil

At the end of each day, a minimum of 0.15 m of daily cover soil will be placed on all exposed waste. Daily cover soils will help minimise litter migrating from active areas and also control odour. A coarse-grained soil will be utilised as daily cover, whenever possible, to promote hydraulic connection between waste lifts and allow leachate to infiltrate readily to the base of the landfill. Where fine-grained soils are utilised as daily cover, small grooves will be cut in the working face at the start of each day to ensure a hydraulic connection of the underlying waste and landfill base.

Dust Control

Dust generation is common at most landfill sites due to the handling of soils and the movement of vehicles along site maintenance and haul roads. Dust impacts result from: landfill site traffic, landfill operation, overburden excavation, soil borrow operation and wind erosion. Dust in the vicinity of a landfill site should not be problematic under normal conditions and is usually controllable under extreme conditions.

To ensure dust does not become a problem at the Site during normal or extremely dry and windy conditions, the following control measures will be implemented:

- i) soil handling operations will be minimized during times of high winds;
- ii) vegetation will be established on inactive areas, if required, to minimize wind erosion; and
- iii) if dry conditions warrant, a dust suppressant (e.g., water or calcium chloride) will be applied to the on-site haul roadways and soil borrow areas, and if required to the active disposal area.

Litter Control

Given the nature of landfilling operations litter control can be problematic under any conditions. However, several measures can be taken to help minimise the amount of wind blown debris leaving the active disposal area of the site. Control measures can be divided into two groups, which include preventative measures to limit the generation of litter and regular maintenance measures to collect litter which does not leave the site. Litter inspections will be carried out around the perimeter of the site on a daily basis.

Preventative litter control measures will be taken to minimise the blowing of debris from the active area of the landfill. The following list presents actions which will be taken to control and minimise the amount of litter generated at the site.

- i) all vehicular traffic transporting waste to and around the Site must be covered or sheeted, if required, to prevent litter from blowing out of the vehicle;
- ii) daily cover soils will be placed over the working face of the landfill in order to minimise the blowing of debris;
- iii) the active face of the landfill and recycling will be kept to a minimum, especially on windy days. This may be accomplished by placing daily cover soils over a portions of the active face, should windy conditions warrant this action; and
- iv) portable litter control fences will be utilised at the active face of the landfill, if required, to prevent wind blown litter from leaving the active disposal area. Temporary (i.e., snow fences) or permanent litter control fences may also be used around the perimeter of the landfill, if required.

Regular Site Maintenance Measures

Under normal operating condition and with the implementation of the above control measures it is still expected that some litter will be blown from the active landfill area. Regular site perimeter maintenance controls this litter and prevents it from leaving the boundaries of the site. The landfill operators will carry out weekly inspections around the perimeter of the site. Any wind blown litter observed during the inspections will be collected and returned to the active landfill area.

Noise Control

Potential noise impacts from the Site will generally result from operation of the landfill construction, waste haulage vehicles and waste/cover soil placement equipment. The operation of this equipment will be conducted in such a manner as to minimise noise impacts, whenever possible. In order to reduce the noise impacts to surrounding residents, operation of landfill equipment will not be undertaken prior to 1 hour before and no later than 2 hours after the approved hours of operation.

All landfill construction, waste haulage and waste/cover soil placement equipment associated with the development, operation, or closure of the site will comply with the noise level limits outlined in applicable regulatory guidelines. In addition, a landfill equipment maintenance program will be implemented at the site by the operator, with

particular attention being given to maintaining and where feasible, improving the noise muffling systems on landfill construction and waste/cover soil placement equipment. Landfill construction and waste/cover soil placement equipment will be inspected by the landfill operators at least annually.

Odour Control

In general, landfills have the potential to emit two types of odours, refuse odour and landfill gas odour. Refuse odour is generated by recently disposed waste and is controllable by the application of daily cover soil. Landfill gas odour is generated during the anaerobic decomposition of organic waste material. Landfill gas will be collected in a series of lateral and header pipes constructed progressively throughout the landfill waste, and will be transported to an on-site landfill gas treatment plant.

Vector and Vermin Control

Common landfill vector and vermin include flies, rats and gulls. The impact of these species is of concern from a health perspective and from an aesthetic perspective. Landfill operations are required to control vector and vermin on the landfill site property.

The following control measures will be undertaken should vector and vermin become problematic:

- a) Flies are a common occurrence at any type of waste disposal operation. The flies breed and maggots develop in the waste, in particular the food wastes. The application of daily cover will ensure that the matured flies are unable to escape the waste material, thus controlling the fly population.
- b) The occurrence of rodents is reduced by the application of daily cover. These creatures are attracted to landfill operations by the odour of the waste, particularly food wastes. By applying daily cover and continually advancing the working face, the attraction is eliminated. Should rodents be noted to extensively inhabit the site, then extermination will be conducted by a licensed exterminator, on an as-required basis.
- c) The bird species most commonly present at a landfill site is the gull which is attracted by food wastes. The application of daily cover will help minimise the attractiveness. Several methods are available beyond the application of daily cover that aid in discouraging the presence of gulls including hawking and erection of an overhead mesh.

Monthly inspections for evidence of vector and vermin will be conducted in conjunction with the monthly litter inspections.

Burning and Scavenging of Waste

Burning of waste will be prohibited at the site. No burning of waste will be conducted during operation of the site. Waste received at the site which is suitable for burning, such as clean wood waste and brush, may be chipped and placed within the landfill disposal area.

Scavenging of deposited and stockpiled waste is prohibited at the Site. No scavenging will be allowed during operation of the Site. Segregation of recyclable items and

recoverable materials from the incoming waste streams will be conducted and removed off-site for subsequent recycling/recovery on an as required basis.

Wet Weather Operation

During wet weather operations surface water will be directed away from the active landfill area by means of temporary soil berms constructed upgradient of the active area, as required. Under extremely wet weather conditions, the disposal operations may be moved to drier working areas to facilitate vehicle travel at the working face.

On-site equipment required to be used for continued landfill operations during rainfall events, will be equipped with closed cabs.

Site roadways will be maintained in a passable condition during wet weather conditions. Secondary haul roads to the active landfill area will be located so as to ensure continuous access to the active face during wet weather conditions. Should washouts of the site roadways occur due to rainfall events, then the roadways will be re-constructed as soon as possible thereafter, in a manner consistent with the design presented in the approved D&O Plan.

(e) Final site cover surface drainage and restoration

The final cover layer over the waste (typically referred to as the landfill cap) shall be placed progressively as filling is completed within each cell. Cell 4 shall be capped first followed by Cell 1, then Cell 2 and finally Cell 3. The cap shall comprise a layer of low permeability soil material (typically clay) which is placed to a minimum thickness of 1 metre by earthworking machinery and engineered in situ to achieve a permeability of at least $1 \times 10^{-8} \text{m/s}$. Normally, this requires the placement of the material in layers with each layer being consolidated and compacted using a roller. As with the basal containment the placement of the capping layer shall be carried out in accordance with a detailed engineering specification and shall be subject to a thorough programme of QA/QC control. It is possible that clays won from the quarry void may be suitable as final capping, otherwise the material will have to be imported from an off-site source.

The final slope profile of the cap shall be approximately 1:4 on the flanks and 1:20 at the crest of the landfill. This will ensure slope stability and allow for effective shedding of surface water off the cap.

The current surface water runoff flows to the lowest point of the quarry extraction void. From here water is channelled via ditching or dewatered via pumping to the water body located at the northwest corner of Parry's Quarry. The northwest water body currently acts as a balancing and settlement lagoon for surface water run-off derived from the active quarry area. It occupies an area approximately 1.7 hectares and has an estimated depth of up to 15 to 20 m. The surface water, as well as any groundwater inflow, from this pond is pumped out intermittently via a 100 mm diameter overland forcemain into an existing 300 mm diameter storm water sewer located along Pinfold Lane. Ultimately this sewer discharges to Alltami Brook to the north west of the site. Consent to discharge surface water from the existing mineral operations was granted by the Environment Agency. This consent allows discharge at a maximum volume of 1200 m³/day and a rate not exceeding 14 litres per second (lps). Available historic documentation appears

to suggest that the existing northwest pond pumping system operates for a minimum duration of eight hours to a maximum twenty-four hours in any given day. Settlement of fines present in the surface water inflow to the northwest pond occurs in the pond prior to pumping. Hence, it is considered that the current water management scheme effectively removes suspended solids from the discharged surface water.

As landfilling reaches completion a ditch around the landfill footprint will convey runoff from completed/capped areas to the detention pond located at the northwest corner of the site. The ditch is proposed to be a V shape channel with 2:1 side slopes and 1.0 m of total depth. The discharge carrying capacity of the ditch ranges from 3.9 m³/s to 5.5 m³/s. When fully capped the contributing surface water drainage area from the proposed landfill site will cover approximately 10.11 hectares.

The detention pond will provide both quantity and quality control for stormwater runoff from developed areas of the site. The pond will discharge to the storm sewer located in Pinfold Lane and it is probable that the current pumping arrangement or a retrofitted pumping system/forcemain will be suitable. A discharge rate not exceeding the present discharge consent of 1200 m³/day or 14 lps to the existing 300 mm diameter storm sewer located northwest of the site is envisaged.

It is currently proposed that the final site restoration will be for an end use comprising public amenity open space and nature conservation. Such restoration works have been implemented successfully on many landfills across the UK. A mixture of native woodland planting, wildflower meadow and open grassland is proposed. This will be delivered in a phased manner as landfilling across each cell is completed.

The low permeability layer described in above will be covered by at least 150mm of suitable soil which allows the proposed final restoration end use to be achieved. Due to the absence of suitable soils from within the site, restoration soils will need to be derived from an off-site location. Typically sources of such material (such as stripped soils from development sites) arise during filling operations with the soils being temporarily stockpiled to use. Should stockpiling be necessary then good practice will be observed to ensure that the structural properties of the soil are maintained prior to use.

The placement of the surface soils will result in the landfill within Cell 1 being completed to its full height and profile as indicated in the sections included as Appendix 2.3 Figure 8 and the final contour plan (Appendix 2.3 Figure 3).

Waste placement, final cover and restoration shall be progressed sequentially across Cells 2, 3 and 4 until the entire landfill has been completed.

(g) Landscaping and Vegetation Establishment

The proposed end use of public open green space will comprise mixed plantings of native British tree and shrub species and wildflower meadow. The proposed proportion of woodland, shrub and meadow plantings will be 20% woodland, around the lower slopes and peripheries of the site, with approximately 20% mixed shrub planting and 60% wildflower meadow. Site restoration proposals are presented in detail in Section 11 (Ecology).

(h) Post-restoration management and monitoring

Once restoration has been completed, monitoring and aftercare of the site will continue in order to ensure management and control of leachate, landfill gas and surface water.

Landfill gas will continue to be utilised for power generation via the gas engines until such time as gas quality declines to a stage where this is no longer possible. From such a point in time gas will be controlled by flaring until the point at which this is no longer sustainable.

Leachate will continue to be collected via the basal collection system and disposed to foul sewer until such time as no significant volumes of leachate are being generated.

The landfill design is based upon full engineered containment of the wastes which will ensure that neither landfill gas nor leachate can migrate laterally or vertically from the landfill body. In order to demonstrate the ongoing effectiveness of containment during waste deposition and after completion, a series of perimeter boreholes will be drilled that shall be completed with standpipes, headworks and vandal proof covers to allow periodic monitoring of both landfill gas and groundwater quality. The wells will extend to a minimum of the maximum depth of the waste body at 82m AOD. The monitoring wells will be positioned at circa 25m intervals around the entire perimeter of the landfill footprint. The most appropriate location for the wells will be adjacent to the outer edge of the internal access road around the landfill. For landfill gas monitoring will be undertaken at monthly intervals during the operational lifetime of the landfill. Following completion the monitoring frequency shall be reduced to quarterly for the first five years after completion and then 6 monthly until such time as the quantity and concentrations of gas being produced from the landfilled wastes are no longer significant.

For groundwater, selected wells circa 10 No. will be monitored on a quarterly basis during landfilling operations in order to record groundwater elevations relative to Ordnance Datum. This will necessitate the accurate survey and levelling of all the installed wells. Groundwater samples will also be collected and submitted for chemical analysis in accordance with Environment Agency guidance. Following completion of landfilling, groundwater monitoring and sampling frequency will be reduced to once every six months until such time as the site is no longer generating significant quantities of leachate.

Maintenance of the restoration vegetation cover shall continue until this has become properly established.

3.0 ENVIRONMENTAL BASELINE DESCRIPTION

3.1 Site Location

The site is located approximately 1km south of Northop Hall and 2.6km north and 4km north east of the centres of Buckley and Mold respectively. The central grid reference for the site is SJ 2755 6652. The current vehicular access to the site is via an unclassified road (Pinfold Lane) leading to the A494 Mold Trunk road which lies adjacent to the southern perimeter of the site. A dismantled railway line runs in a north – south direction along the eastern boundary of the site. Beyond this there is farmland and a service station before reaching the main A55 dual carriageway. The site is bounded to the west by Pinfold Lane and beyond this there is more farmland and a disused quarry owned by Brock plc. To the north of the site are a number of industrial units.

The nearest residential properties are located at Parry's Cottages some 50m to the south east of the site. A hotel, located in the service area off the A55 is positioned approximately 150m from the north eastern boundary. Within 100 to 500m of the western and northern boundaries of the site are a number of industrial works units, and approximately half a kilometre to the south is Oaks Farm. The nearest village is Alltami, located 1km west of the site, along the A 494.

3.2 Topography

The site is situated on the western flank of a low ridge approximately 10km south of the Dee Estuary. The land to the south of the site and the southwest is at an elevation of approximately 116m and rises southwards to a maximum of 160m AOD in Buckley. Land to the northeast of the site is level and has an elevation of approximately 90m AOD. There is a steep sided valley associated with Wepre Brook to the north east of the site; the base of this valley is at about 55m AOD. There is another steep sided valley associated with the Alltami Brook to the west and north west of the site.

3.3 Geology

3.3.1 Regional

The site is located within a large outcrop of Carboniferous Coal Measures strata which are overlain to the east by the Triassic Sherwood Sandstone Group and by Carboniferous Millstone Grit and Limestone series to the west. Parry's Quarry is wholly underlain by Carboniferous Coal Measures.

3.3.2 Local

The solid geology of the site is overlain by glacial till in all but the southern part of the site. A fault runs through the solid geology adjacent to the western quarry face and a further fault runs 100m east of the dismantled railway. These faults downthrow the rock strata to the east at angles of between 12 and 15 degrees. Below the Coal Measures the site is underlain by mudstones, sandstones and siltstones of the Buckley Formation.

Mining has been carried out on the site in the past and two, now sealed shafts are located in the extreme southwest of the site.

3.4 Hydrogeology

3.4.1 Regional

The hydrogeological regime is controlled by the aquifer properties of the sandstones and mudstones present together with faulting and fissuring which facilitates interconnection between horizons. Faulting will provide preferential pathways for groundwater which is modified by local mine workings.

The Environment Agency designates the Coal Measures sequence as a Minor Aquifer.

3.4.2 Local

The glacial till is assumed to have generally low hydraulic conductivity and low effective porosity and will therefore inhibit recharge to the underlying coal measures.

The Buckley Formation and underlying Bettisfield Formation predominantly comprise strata of low to medium hydraulic conductivities. However, the presence of sandstone horizons, fracturing and fissuring and the likely effects of mining result in an increased mass hydraulic conductivity.

3.5 Hydrology

The site lies within the catchment of the River Dee which is situated approximately 3.5km northeast of Parry's Quarry. Alltami Brook is the nearest watercourse to the site and runs in a north easterly direction around the west of the site, approximately 250m away. The confluence of Wepre Brook and Alltami Brook is situated 900m north of the site. Wepre Brook continues flowing in a north easterly direction before joining with the River Dee. Water quality available for Wepre Brook shows it to be of General Quality Assessment Grade B, which denotes good quality.

A water body with an area of 1.7 ha and a depth of between 15 and 20m is located in the northwest of the quarry. This water body was created by previous quarrying activity. To the south of the site there is currently only one water body associated with the former quarrying activities.

Rainfall data has been provided by the EA from the closest rain gauge at Hawarden Airport approximately 7km east of the proposed development site. Average monthly rainfall between 2001 and 2005 ranged from 39mm during March to 92mm in October.

There are no licensed surface water abstractions from water bodies within 2km of the site.

3.6 Soils

The soil type in the area is classified as Wick 1 Association, according to the Soil Survey for England and Wales (1985). The Wick Association occurs widely throughout northern England. It is a well drained series of coarse loamy and sandy soils overlying fluvioglacial and terrace drift of variable stoniness. The series is also good for

agricultural use due to its coarse texture, large porosity and small retained water capacity.

3.7 Climate

The climate of North Wales is temperate and highly variable. The mean annual temperature based on 2001-2005 meteorological data is around 10.5°C with an average minimum daily temperature range of 6.5°C and average maximum daily temperature of 14.4°C. Temperatures will vary according to altitude, seasonal variations and proximity to the coast. Meteorological data obtained from a site east of the proposed development site at Hawarden, for a five year period between 2001-2005, is likely to be representative of rainfall at the proposed development site with an average annual rainfall of approximately 912mm. In terms of sunshine the area receives less than the UK average due to the local terrain and proximity to the Atlantic causing more cloud formation whilst the prevailing wind arises from the south and west of the proposed development site.

3.8 Archaeology

There are no known archaeological sites associated with the proposed development site. There is likely to have been little activity in the area during prehistoric and Roman periods and there is no recorded archaeological evidence. During the Medieval period the site is thought to have been heavily forested with a very low population density, it is therefore thought unlikely that significant archaeological remains survive. Post medieval period saw the expansion of local industry with small scale coal mining taking place in a number of areas in North Wales possibly to fuel kilns for local pottery works. The late 19th century saw two large brick works leading to a quarry being established on the proposed development site. In conclusion, there are no known archaeological sites associated with the proposed development and it is deemed unlikely that significant archaeological remains survive from historical land use due to the extensive ongoing quarrying activities which have taken place on the site.

3.9 Ecology

The area within the south eastern quadrant of the site as defined by registered title boundary delineating ownership by Robin Jones and Sons Ltd, contains two existing ponds. This area has been included as part of the Buckley Claypits and Commons, Connahs Quay Ponds and Woodlands SSSI, which has been recently classed as a Special Area of Conservation (SAC) in addition to its SSSI status. The area is delimited by a metal boundary fence designed to prevent newt migration into the working area of the quarry.

The area has been classified as a SAC because it supports great crested newt. Note that collectively, the Deeside and Buckley Newt sites are thought to be one of the best great crested newt sites in the UK.

3.10 Proposed Improvement of the A55 Ewloe to Northop

Currently under consideration are plans to improve the A55/A494 Ewloe Interchange. A number of different routes are currently under consideration as part of this process. Details of these routes can be found in Appendix 6.2.

4.0 EIA METHODOLOGY

4.1 Introduction

The requirement for an Environmental Impact Assessment (EIA) has been determined by reference to The Town and Country Planning (Environmental Impact assessment) (England and Wales) Regulations 1999 (SI 1999 No. 293). These regulations implement the European Council Directive 97/11/EC which amended EC Directive 85/337/EEC.

4.2 EIA Screening

The regulations referred to above identify that landfilling of non hazardous waste comprises a Schedule 2 development where factors such as the nature, size, location and proximity to sensitive environmental receptors need to be taken into account to determine whether the undertaking of a full EIA is justified. Schedule 2 identifies that landfills exceeding an area of 0.5 hectares may require an EIA.

A decision to undertake an EIA has been reached for the proposed landfill development at Parry's Quarry for the following reasons;

- Landfilling of the waste types proposed for the site has the potential for significant environmental effects
- The size of the proposed landfill site footprint (excluding ancillary features) approximates to 10 hectares
- The site lies adjacent to a Site of Special Scientific Interest and Special Area of Conservation (SAC) as a result of the presence of Great Crested Newts
- Although the site locality is not densely populated there are residential properties and other sensitive land uses (e.g. a hotel) located within 100m of the site boundary

4.3 EIA Scoping

Once the decision to prepare an EIA had been reached, a scoping opinion was sought from Flintshire County Council who identified specific requirements with respect to the coverage and content of the Environmental Impact Assessment (EIA). The scoping document provided required the following elements to be included within the Environmental Statement:

- Information describing the proposed development site including physical characteristics such as access and transport features, land use requirements during different phases of the project and operational features of the project to include resources used for the project and residues and emissions including noise and air. Consideration of alternative sites was also requested as part of this section.
- Information describing the proposed development site and its environment, to include; population, flora and fauna, soil, water, air, landscape and topography and any other environmental features.

- Assessment of effects of the proposed development to include visual effects, effects of emissions from the proposed development and effects of the proposed development on local roads and transport.
- Effects of the proposed development on flora, fauna and geology to include loss of and damage to habitats, plants and animal species. Loss of and damage to geological, palaeontological and physiographic features in addition to any other ecological consequences.
- Effects on land including changes in topography, stability of soils and soil erosion. Land use affects including alternative uses and effects on the surrounding land uses of the site including agriculture and dealing with waste disposal.
- Effects on water including effects of the proposed development on drainage patterns, changes to other hydrographic characteristics, effects of pollutants such as waste on water quality. Affects of particulate matter, effects arising from traffic related to the development, effects of association of the proposed development with other existing or proposed developments, secondary effects resulting from the interaction of separate direct effects listed above.
- Mitigating measures, where significant adverse effects are identified, a description of the measures to be taken to avoid, reduce or remedy those effects.
- Risk of accidents and hazardous development and how significant impacts will be avoided.

4.4 EIA Methodology

There is no statutory methodology for EIA, there are however good practice guidelines. A balance between standard methodology and good practice guidelines will be followed for each chapter. Each chapter will have a description of the baseline subject area and an introduction into the EIA methodology for each subject. An assessment of sensitivity of receptors for each chapter and a description of how the degree of significance for the impacts will be determined will also be included. A section on mitigation required to reduce impacts will be included followed by an assessment of any residual impacts.

4.5 Environmental Management Plan

The final section of the EIA will bring together all of the proposed environmental measures and which will indicate the timescale and responsibilities required in different subject areas to ensure that there are no significant residual impacts.

5.0 POLICIES AND PLANS

5.1 Introduction

This section considers the predicted effects of the construction of the proposed Parry's Quarry Landfill Site development on policies and plans. It includes only those impacts, which directly affect, either beneficially or adversely, policies and plans within the development envelope of the site.

5.2 Methodology

The assessment of the proposed development impacts upon policies and plans was undertaken through a desktop review of relevant planning policy documents, together with a review of planning applications adjacent to the development area.

Consideration will be given to national, regional and local planning guidance, taking into account the following:

- i. Planning Policy Wales (2002)
- ii. Technical Advice Note (TAN) 5: Nature Conservation and Planning (1996)
- iii. Technical Advice Note (TAN) 8: Energy Efficiency (2005)
- iv. Technical Advice Note (TAN) 9: Enforcement of Planning Control (1998)
- v. Technical Advice Note (TAN) 11: Noise (1997)
- vi. Technical Advice Note (TAN) 12: Design (2002)
- vii. Technical Advice Note (TAN) 21: Waste (2001)
- viii. Minerals Technical Advice Note (TAN) 1: Aggregates (2006)
- ix. Welsh Office Circular 60/96: Planning and the Historic Environment: Archaeology
- x. Welsh Office Circular 11/99: Environmental Impact Assessment
- xi. Welsh Office Circular 20/01: New Guidance for Local Planning Authorities on European Protected Species and Changes in Licensing Procedures
- xii. North Wales Regional Waste Plan (2003 – 2013)
- xiii. Structure Plan Second Alteration: Flintshire Edition (1997)
- xiv. Flintshire Unitary Development Plan, written statement (2000 – 2015) – Deposit Draft Plan 2003

Assessment of the significance of any environmental impact is based upon characteristics of the impact and the receptor. Within this assessment, magnitude of effect has been defined using the Highways Agency's WebTAG criteria. WebTAG is an appraisal tool used by the Highway's Agency for EIAs, and for this particular topic uses a three-point contextual scale adopted from the Land Use Policy Sub Objective – Unit 3.7.2, Positive, Neutral and Negative. This represents the best practise methodology for assessment of policies and plans in EIAs for road schemes, and can be used when assessing other development schemes. WebTAG guidance is now seen as a requirement for all projects/studies that require government approval. It is therefore a suitable methodology for assessing how the proposed Parry's Quarry Landfill Site may affect currently policy and planning guidance. An explanation of the criteria is as follows:

- Beneficial – where the scheme positively supports the implementation of policies and plans.
- Neutral – No benefit or impact in either direction, or the policy allows for magnification of any impacts.

- Adverse – Where the scheme adversely effects the implementation of policies and plans and which cannot be resolved.

5.3 Baseline Conditions

The following represents the review of relevant planning policies/guidance notes and planning applications pertinent to the proposed landfill development scheme at Parry's Quarry.

5.3.1 Policies

Planning Policy Wales (2002)

- Sections 2.1: Commitment to sustainable development,

The guidance sets out the Assembly's commitment to sustainable development, that is, *'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'*. Principles of sustainable development are described along with key policy objectives.

- Section 2.7: Preference for the re-use of land

The guidance states that previously developed (or Brownfield) land should wherever possible be used in preference to Greenfield sites. This definition extends to land used for mineral extraction.

- Section 4.3: Environmental impact assessment

The guidance note describes the Environmental Impact Assessment (EIA) process, what should be included in the assessment and when it is necessary to carry out an EIA.

- Section 5.2: Caring for biodiversity

The guidance note introduces the UK Biodiversity Action Plan (UKBAP) and describes its objectives, which include the conservation and where practicable, the enhancement of: *'populations of native species and wildlife, quality and range of wildlife habitats, internationally important and threatened species, species, habitat and natural managed ecosystems characteristic of local areas and biodiversity of natural and semi-natural habitats where this has been diminished over recent decades'*.

- Section 5.3: Measures to conserve landscape and biodiversity: Statutory designations

The policy states that: *'the Assembly will ensure that international responsibilities and obligations for conservation are fully met, and that, consistent with the objectives of the designation, statutorily designated sites are protected from damage and deterioration, with their important features conserved by appropriate management'*.

- Section 5.5: Development control and the conservation and improvement of the natural heritage

The policy advises how biodiversity and landscape issues should be taken into account in determining planning applications. Of particular relevance is part 5.5.9, which refers to the need for EIA where a development is likely to affect a designated area such as a Site of Special Scientific Interest (SSSI) or Special Area of Conservation (SAC). It should be noted that the proposed site abuts part of the Deeside and Buckley Newt Sites SAC. Additionally, part 5.5.11 advises that the presence of a species that is protected under European or UK legislation is a material consideration, if the development is likely to disturb or harm that species or its habitat. Great Crested Newts are protected under both UK and European law.

➤ Section 12.7: Development control and waste planning

The policy states that: *'the environmental impact of proposals for waste management facilities must be adequately assessed, supported by independent surveys where appropriate, to determine whether a planning application is acceptable and, if the adverse impacts on amenity cannot be mitigated, planning permission should be refused'*.

➤ Section 13.5: Dealing with unstable and contaminated land

The policy recommends that developments should lessen the risk from natural and human-made hazards such as land instability and land contamination. Additionally advice is given on new provisions of Part IIA of the Environmental Protection Act 1990, which came into force on 1st July 2001. One of the main issues relating to the interface of the planning system and the new regime will be: where the future use or development of land means that the land will be designated as contaminated land under Part IIA.

➤ Section 13.13 Reducing noise and light pollution

In regard to noise, the objective of the policy for noise is to minimise emissions and reduce ambient noise levels to an acceptable standard. Additionally, in regard to lighting, the guidance recognises the need to strike a balance between providing lighting to enhance safety and security etc. and to protect the natural and historic environment including wildlife, retain dark skies where appropriate and prevent glare and respect the amenity of neighbouring land uses.

➤ Section 13.15: Development control and noise and lighting

The policy states that special consideration is required where noise-generating developments are proposed in or near statutory designated areas or protected sites.

5.3.2 Guidance Notes

TAN 5: Nature Conservation and Planning

The advice note summarises issues relevant to nature conservation and planning. This includes advice on the protection of species and development plans in protected areas such as Sites of Special Scientific Interest (SSSI) and Special Areas of Conservation (SAC) among others. It should be noted that the proposed site abuts part of the Deeside

and Buckley Newt Sites SAC. The advice note states that when a SAC will be potentially affected by a proposed development, an Environmental Impact Assessment (EIA) will usually be required. Additionally if the proposals are likely to have a significant effect on the site, then an Appropriate Assessment of the development's implications will need to be carried out as required by the Habitats Regulations 1994.

TAN 8: Renewable Energy

The advice note addresses issues relating to renewable energy, energy efficiency, and energy conservation and planning. Of particular relevance to the development is Section 3.0 – Offshore Wind and Other Onshore Renewable Energy Technologies. Energy from waste and methane capture from landfill are highlighted, however the Assembly's priority is to reduce waste with energy recovery only coming after recycling and composting.

TAN 9: Enforcement of Planning Control

The advice note states that care must be taken to ensure that authorised waste disposal developments carry out restoration and aftercare work fully in accordance with the terms of the agreed scheme.

TAN 11: Noise

The advice note states that noise-generating developments must not create an unacceptable degree of disturbance.

TAN 12: Design

The advice note recognises the Assembly Government's commitment to achieving good design in all developments at every scale throughout Wales. Additionally, details how this can be achieved within the planning system are outlined with landscape and biodiversity being listed as considerations.

TAN 21: Waste

The advice note covers a range of planning issues relating to waste, including how compliance with legislation should be met (i.e. The Waste Framework Directive, The Landfill Directive and the Waste Strategy 2000). Of most relevance in terms of the development is the recognition that landfill will continue as a waste disposal option and that there is a need for some landfill of waste.

Minerals TAN 1: Aggregates

The advice note states that aggregates are the basic constituents used in construction and are placed under three categories: primary aggregates, mineral waste and secondary/recycled aggregates. It also recognises that it is essential to the countries economic and social well being that the construction industry is provided with an adequate supply of material but not to an unacceptable detriment to the environment. The overarching objective of the policy is therefore: *'to ensure supply is managed in a sustainable way so that the best balance between environmental, economic and social considerations is struck, while making sure that the environmental and amenity impacts*

of any necessary extractions are kept to a level that avoids causing demonstrable harm to interests of acknowledged importance'.

Welsh Office Circular 60/96: Planning and the Historic Environment: Archaeology

The Welsh Office Circular covers a range of issues relating to archaeology in the planning system. Section B advises on handling archaeological matters in the planning process, which gives detail on early consultation with developer and planning authority, archaeological assessments, field evaluations, consultations by planning authorities and planning decisions.

Welsh Office Circular 11/99: Environmental Impact Assessment

The guidance note gives advice on carrying out an Environmental Impact Assessment (EIA) under the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 – S.I. 1999 No. 293, which implement Council Directive No. 85/337 EEC on the assessment of the effects of certain public and private projects on the environment (the EIA Directive).

Welsh Office Circular 20/01: New Guidance for Local Planning Authorities on European Protected Species and Changes in Licensing Procedures

The circular informs local planning authorities in Wales of the new licensing procedures under EC Directive 92/43/EEC (the Habitats Directive) for developments affecting European Protected Species, of which Great Crested Newts are one of.

5.3.3 Regional Plans

North Wales Regional Waste Plan (2003 – 2013)

The plan was formally agreed by the Welsh Assembly Government on 17th March 2004 and has been formally endorsed by Flintshire County Council. It is currently under review and a 'First Review' of the plan is due to be published in 2007. Until such time the 'North Wales Regional Waste Plan (2003 – 2013)' should be the document that is worked to. It should be noted that the plan is non-statutory.

The plan considers six possible options to waste management within the region, and concludes the best way for planning for future waste management is through a combination of two of the different options (the Hybrid option). This would seek to maximise re-use, composting and recycling and where possible be subject to energy from waste treatment and be subject to MBT. The residual waste would be landfilled.

5.3.4 Local Plans

In the case of Flintshire, the Clwyd Structure Plan First Alteration, the Delyn Local Plan (covering the north and west of the County) and the Alyn and Deeside Local Plan (covering the south and east) are statutory plans (FCC Website). However, the plan period of both the Structure Plan First Alteration and the Delyn Local Plan expired in 1996 and the Alyn and Deeside Local Plan in 2003.

No statutory document has superseded these plans, but the Council has approved the following plans for development control purposes as they reflect more up to date planning policy guidance. These are: the Structure Plan Second Alteration: Flintshire Edition, Draft North Flintshire Local Plan and the Flintshire Unitary Development Plan Deposit Draft. In the case of the proposed Parry's Quarry development, the Structure Plan Second Alteration: Flintshire Edition and the Flintshire Unitary Development Plan Deposit Draft are relevant and should be considered as part of this assessment. The individual policies within the plans, which are relevant to the proposed development, are listed below:

Structure Plan Second Alteration: Flintshire Edition (1997)

General Development Considerations

GEN 1 – New developments should seek to achieve a high quality of design and to minimise any adverse impact on the environment

GEN 2 – New developments should seek to make the best use of resources

Conservation and the Environment

CONS 8 – Development proposals which are likely to adversely affect the integrity of a Ramsar Site, Special Protection Area (SPA), Special Area of Conservation (SAC) or potential SPA's or SAC's, will not be granted planning permission unless there are no alternative solutions and there are imperative reasons of overriding public interest.

CONS 14 – Planning permission will only be granted for new development, which will not have an unacceptable effect on public health, on the natural environment or on general amenity by virtue of emissions to water, land or the atmosphere, or by noise or vibration. Where permission is granted it will be subject to appropriate safeguards for neighbouring uses.

CONS 16 – Schemes for the disposal, handling or treatment of waste will only be permitted where the proposal will have no significant adverse effects on amenity, nature conservation interests, water resources and the aquatic environment, the local landscape, the local highway network, public health and safety, and the local community. In addition, proposals for waste disposal sites must also be able to demonstrate that:

- (a) Options for waste minimisation and recycling at the source of the waste production have been explored first
- (b) There is no reasonable existing alternative site of facility
- (c) The proposals will satisfy a need for such a facility
- (d) Restoration provisions are adequate.

Employment Policies

EMP 3 – Land to be allocated or given planning permission for employment development should normally satisfy several criteria including not increasing air, noise, water pollution or hazard to unacceptable levels, nor be in conflict with structure plan policies which protect the environment.

EMP 8 – Industrial developments which are potentially polluting will only be permitted on land either allocated or with planning permission for employment development and where:

- The proposal complies with the requirements of Criteria B to H of Policy EMP 3.
- The industry does not cause an unacceptable loss of amenity etc.
- The industry does not cause unavoidable nuisance, hazard or damage to neighbouring areas.

Mineral Policies

MIN 6 – Where there is no overriding need to return a mineral working site to agricultural use, proposals for alternative after-use will be encouraged which would improve its landscape, ecology or suitability for sport and recreation, or which would secure development consistent with other development plan policies.

MIN 7 – Land worked for minerals should be restored as quickly as possible to standards appropriate to its after-use.

Flintshire Unitary Development Plan, Written Statement (2000 – 2015) – Deposit Draft Plan 2003

Under the Local Government (Wales) Act 1994, Flintshire County Council is required to prepare a Unitary Development Plan (UDP) for its administrative area. Once formally adopted, this will become the statutory document that will guide development within the county over the coming years and will repeal and replace existing Structure and Local Plans. At present, the Council anticipates producing Proposed Changes to the UDP by Autumn 2006 with a Public Inquiry following in Spring 2007.

The individual policies within the UDP Deposit Draft that are relevant to the proposed development are listed below:

Policies

STR1: New Developments – New development will be (among other things) required to create a safe, healthy and secure environment and protect standards of residential and other amenities; required to have regard for physical and natural environmental considerations such as flooding and land stability; required to minimise or negate pollution to air, water and land; and assessed in terms of the precautionary principle whereby development proposals that would have significant and uncertain environmental, social, cultural or economic impact will be refused, in the absence of information that proves beyond doubt that the impact can be negated or mitigated.

STR3: Employment – The Plan will facilitate a diverse and sustainable economic through (among other things): the provision of 300 ha of employment land over the plan period.

STR7: Natural Environment – The natural environment of Flintshire will be safeguarded by several proposals including: protecting the character, features and appearance of the

open countryside and the undeveloped coastline and protecting and enhancing areas, features or corridors of nature conservation, biodiversity and landscape quality both in urban and rural areas, including urban greenspace.

STR10: Resources – Developments will be required to make the best use of resources through (among other things): The use of brown field land and buildings where ever practicable in preference to green field land or land with ecological value; minimising the production, transport and disposal of resources and waste in accordance with the waste management hierarchy and energy recovery with the effective use of waste heat and utilising where possible clean, renewable and sustainable energy generation where environmentally acceptable in preference to non-renewable energy.

General Development Considerations

GEN1: General Requirements for Development – Developments that require planning permission and is in accordance with the plans other policies should be located on land, or within suitable building that satisfy several requirements.

GEN3: Developments Outside Settlement Boundaries – Development outside settlement boundaries will not be permitted, however several exceptions are made including developments relating to agriculture, tourism, leisure, mineral extraction and rural diversification among other things.

GEN4: Open Countryside – Developments outside allocated sites or settlement boundaries will be permitted for uses which are appropriate to the open countryside or are essential to a particular rural location and cannot be sited elsewhere.

GEN6: Environmental Assessment – If a development is likely to have a significant effect on the environment it must be accompanied by an Environmental Statement as required by the 'Environmental Impact Assessment Regulations' and suitable supporting environmental impact information in all other cases.

Design

D1: Design Quality – Development will be permitted only if applicants have demonstrated to the satisfaction of the County Council that their proposals have sought to achieve the best possible standard of design.

D2: Location and Layout – Development will be permitted only if (among other things): it relates to the local topography, aspect and micro-climate and its location, siting and layout makes the best use of land, minimises the need to travel and provides a safe attractive environment.

D4: Landscaping – Development will only be permitted where a high standard scheme of hard and soft landscaping will be submitted as part of the planning application.

D5: Outdoor Lighting – Development will be permitted only where any associated lighting is restricted to the minimum which is necessary to (among other things): ensure public safety and security and prevent light pollution from excessive glare.

Trees, Woodland and Hedgerows

TWH2: Developments Affecting Trees and Woodlands – Development proposals will be permitted only where there is no significant loss of or harm to, important trees or woodland. Where the principal of development affecting trees or woodland is acceptable the Council will require several items are addressed.

Landscape

L1: Landscape Character – New development must be designed to enhance or maintain the character and appearance of the landscape.

Wildlife and Biodiversity

WB1: Protected Species – Development that would have an adverse effect on important species or their habitats will not be permitted unless appropriate measures are taken to secure their long-term protection and viability.

WB2: Sites of International Importance – Development proposals that are likely to affect the integrity of Ramsar Sites, Special Protection Areas (SPAs) or Special Areas of Conservation (SACs) will not be granted planning permission unless there are no alternative solutions or there are imperative reasons of overriding public interest.

WB3: Statutory Sites of National Importance – Planning permission will not be granted for development that is likely to have an adverse affect on the nature conservation and scientific value of Sites of Special Scientific Interest (SSSI).

WB4: Local Sites of Wildlife and Geological Importance, Wildlife Sites and Regionally Important Geological Sites will be protected. Planning permission will not be granted for development that is likely to destroy or seriously affect their nature conservation or geological value.

WB5: Undesignated Wildlife Habitats, Flora and Fauna – Development will be permitted only if the County Council are satisfied that it will not significantly harm wildlife and habitats of local importance.

WB6: Enhancement of Nature Conservation Interest – The incorporation within development proposals of measures which improve the nature conservation value of an area will be supported by the local planning authority.

Historic Environment

HE8: Recording of Historic Features – Development will be permitted only where there is provision for recording of any historic features likely to be affected by the development.

Access and Communications

AC2: Pedestrian Provision and Public Rights of Way – Development will only be permitted where (among other things) any existing public rights of way are retained and integrated sympathetically into the landscaping of the site. Where diversion or alternative

provision is deemed necessary, this should be designed and located to provide at least equivalent convenience and enjoyment and the diversion should be complete before the development commences.

AC13: Access and Traffic Impact – Development will only be permitted if: approach roads to the site are of an adequate standard to accommodate the traffic likely to be generated by the development without compromising public safety, health and amenity; and safe vehicular access can be provided by the developer both to and from the main highway network.

Minerals

MIN4: Restoration and After Care – The mineral authority require that all mineral development proposals be accompanied by a scheme of restoration and aftercare. The scheme should fully address and make reference to several criteria, including: the proposed after-use and the final landform design.

Energy, Waste and Pollution

EWP6: Managing Waste Sustainably – Proposals for new waste facilities will be rigorously tested to ensure that: facilities are provided to manage waste arisings in Flintshire; facilities are well located to existing or planned waste management facilities and fit well with the overall Flintshire waste management infrastructure; facilities should seek to deal with waste as close to the generation point as possible; facilities should utilise waste in accordance with the waste hierarchy seeking to ensure maximum benefits of reusing waste are achieved while minimising damage to the environment and; the development will utilise the existing transport network and will not have an adverse impact on the local road network. Traffic will be restricted to operating in appropriate hours of the day.

Flintshire County Council have partially accepted the merits of Parry's Quarry as a landfill site in their response to the representations made by the applicant to the Deposit Draft Unitary Development Plan (Ref: 03148). The Council propose to include the site in the plan as a preferred area of search with the potential to accommodate a waste management use.

EWP7: Control of Waste Development and Operations – Proposals for new waste management facilities will be permitted as long as they meet the following criteria: the development does not detract from the natural beauty of Clwydian AONB, the Dee Estuary or the Halkyn Mountain; the development does not either directly or indirectly detract from the value of recognised features of the landscape, sites of nature conservation importance, and/or site/locations of historic archaeological and/or architectural importance; the land is not agricultural grade 1, 2 or 3a, the development does not detrimentally affect the health and amenity of the neighbouring land users , does not significantly affects residents quality of life and does not harm the economic attractiveness of the locality; the movement of traffic to and from the site does not pose an unacceptable disturbance to local communities either through noise, smell, vibration, smoke, air pollution and/or traffic related disturbance; measures are incorporated within the proposal to mitigate the adverse impacts of any waste developments including appropriate landscaping and screening and the safeguarding or repositioning of public

rights of way; and a detailed scheme of restoration is submitted together with a proposal for appropriate after-use.

EWP9: Reusing Development Waste – Wherever possible it will be required that proposals seek to minimise the waste generated through the development process and seek to dispose of the waste in accordance with the requirements of the waste hierarchy.

EWP11: Pollution – New developments that would create an additional risk of pollution or hazard would only be permitted where: it would not create or increase the risk to the general public outside the boundaries of the site; and it would not impose significant restrictions on the use or development of surrounding land.

EWP12: Nuisance – Proposals that are likely to cause an increase in noise, vibration, odour, dust or light pollution will only be permitted if the developer has demonstrated that there will be no detrimental impact on users outside the boundaries of the site, who may be sensitive to such nuisance.

5.3.5 Planning Applications

Following a telephone conversation with the Flintshire County Council Planning Department, it was revealed that at the time of asking (25th August 2006) no planning applications in the area likely to affect the scheme had been submitted.

5.4 Impact Assessment

5.4.1 Significance of Impacts

Table 5.1 is a matrix setting out the relevant plans policies and identifying the significance of impact the scheme may have upon them. The significance criteria which has been used is the WebTAG three-point contextual scale, taken from the Land Use Policy Sub Objective – Unit 3.7.2 and is explained in Section 5.2.

Table 5.1 Relevant planning policies and significance of impact

Policy Topic	Impact / Comment
Planning Policy Wales	
Sections 2.1: Commitment to sustainable development,	Beneficial: <i>Proposal provides for society's future needs without comprising future requirements. Also reuses an existing quarry site.</i>
Section 2.7: Preference for the re-use of land	Beneficial: <i>Use of a previously developed site.</i>
Section 4.3: Environmental impact assessment	Beneficial: <i>Environmental Impact Assessment being prepared in support of the application.</i>
Section 5.2: Caring for biodiversity	Beneficial: <i>Some initial disbenefits due to loss of areas of vegetation. However agreement with CCW to increase area for Great Crested Newt habitat to complement SSSI/SAC site adjacent to the application site and enter into a 21 year management programme.</i>

Policy Topic	Impact / Comment
Section 5.3: Measures to conserve landscape and biodiversity: Statutory designations	Beneficial: <i>Some initial disbenefits due to loss of areas of vegetation. However agreement with CCW to increase area for Great Crested Newt habitat to complement SSSI/SAC site adjacent to the application site and enter into a 21 year management programme.</i>
Section 5.5: Development control and the conservation and improvement of the natural heritage	Beneficial: <i>Some initial disbenefits due to loss of areas of vegetation. However agreement with CCW to increase area for Great Crested Newt habitat to complement SSSI/SAC site adjacent to the application site and enter into a 21 year management programme.</i>
Section 12.7: Development control and waste planning	Beneficial: <i>The EIA supports the planning application for the landfill proposals.</i>
Section 13.5: Dealing with unstable contaminated land	Beneficial: <i>The proposals will meet the objectives of the policy guidance.</i>
Section 13.13: Reducing noise and light pollution	Beneficial: <i>In operating the site the applicants will have to meet any conditions attached by the local planning authority and those of the Environmental Health Officer.</i>
Section 13.15: Development control and noise and lighting	Beneficial: <i>As with Section 13.3 above, any requirements will be established through the planning consent.</i>
Technical Advice Notes	
TAN 5: Nature Conservation and Planning	Beneficial: <i>Some initial disbenefits due to loss of areas of vegetation. However agreement with CCW to increase area for Great Crested Newt habitat to complement SSSI/SAC site adjacent to the application site and enter into a 21 year management programme.</i>
TAN 8: Renewable Energy	Neutral: <i>The scheme offers potentials for energy capture from landfill. However this is not a current priority of the Assembly Government.</i>
TAN 9: Enforcement of Planning Control	Beneficial: <i>Restoration and aftercare requirements will be established through the planning consent.</i>
TAN 11: Noise	Beneficial: <i>Requirements of Environmental Health Officer will be met by the site operators.</i>
TAN 12: Design	Beneficial: <i>Restoration and associated landscaping proposals provide scope to enhance landscape and biodiversity assets.</i>
TAN 21: Waste	Beneficial: <i>The proposal reflects the underlying philosophy of the Assembly Government to waste management and disposal.</i>
Mineral TAN 1: Aggregates	Beneficial: <i>The proposal meets the objectives of the guidance note.</i>
Welsh Office Circulars	
WOC 60/96: Planning and the Historic Environment: Archaeology	Beneficial: <i>The applicant will ensure any archaeological requirements are met through the planning consent.</i>
WOC 11/99 Environmental Impact Assessment	Beneficial: <i>The EIA is being prepared to support the planning application and recognises the possible environmental effects of the proposal.</i>

Policy Topic	Impact / Comment
WOC 20/01: New Guidance for Local Planning Authorities on European Protected Species and Changes in Licensing Procedures.	Beneficial: <i>The operator will ensure any licensing requirements for developments affecting European protected species.</i>
North Wales Regional Waste Plan (2003 – 2013)	
	Beneficial: <i>The proposal would contribute to the Hybrid option adopted by Regional Group. Also the Regional Strategy agrees with the requirements of TAN21.</i>
Structure Plan Second Alteration: Flintshire Edition (1997)	
General – GEN 1	Beneficial: <i>The proposal includes for the reuse of an existing quarry for landfill and seeks to minimise effects upon the environment.</i>
General – GEN 2	Beneficial: <i>The scheme reuses a quarry site for landfill.</i>
Conservation and the Environment – CON 8	Beneficial: <i>Some initial disbenefits due to loss of areas of vegetation. However agreement with CCW to increase area for Great Crested Newt habitat to complement SSSI/SAC site adjacent to the application site and enter into a 21 year management programme.</i>
Conservation and the Environment – CON 14	Beneficial: <i>Site operation, restoration and aftercare will be subject to the requirements of the relevant statutory notices.</i>
Conservation and the Environment – CON 16	Beneficial: <i>The scheme will be subject to conditions and requirements through the planning consent.</i>
Employment – EMP 3	Beneficial: <i>Any hazard requirements will be subject to agreement with the relevant statutory bodies.</i>
Employment – EMP 8	Beneficial: <i>Policy objectives will be met through the planning consent and any attached conditions.</i>
Minerals – MIN 6	Beneficial: <i>Reuse for landfill and associated restoration and aftercare will reset policy objectives.</i>
Minerals – MIN 7	Beneficial: <i>Restoration will be completed at the earliest opportunity.</i>
Minerals – MIN 8	
Flintshire Unitary Development Plan, Written Statement (2000 – 2015) – Deposit Draft Plan 2003	
STR1: New Developments	Beneficial: <i>The scheme and its associated operation, restoration and aftercare will meet the policy objectives.</i>
STR3: Employment	Beneficial: <i>Scheme will contribute to employment provision.</i>
STR7: Natural Environment	Beneficial: <i>The restored scheme offers the scope for landscape and biodiversity enhancement.</i>
STR10: Resources	Beneficial: <i>Scheme involves reuse of brownfield land and reflects policy objectives in terms of waste management.</i>
GEN1: General Requirements for Development	Beneficial: <i>Scheme meets with policy objectives.</i>
GEN3: Developments Outside Settlement Boundaries	Beneficial: <i>Scheme includes for further mineral extraction as part of the overall proposals.</i>
GEN4: Open Countryside	Beneficial:
GEN6: Environmental	Beneficial:

Policy Topic	Impact / Comment
Assessment	
D1: Design Quality	Beneficial:
D2: Location and Layout	Beneficial:
D4: Landscaping	Beneficial: <i>Restoration and aftercare proposals will reflect policy objectives.</i>
D5: Outdoor Lighting	Beneficial: <i>Any lighting required for operations will reflect requirements of Environmental Health Officer.</i>
TWH2: Developments Affecting Trees and Woodlands	Neutral: <i>Scheme requires the removal of some 300 square metres of self set vegetation, mostly silver birch. However the restoration proposals allow for soft landscaping which will allow for appropriate levels of replacements.</i>
L1: Landscape Character	Beneficial: <i>The scheme will allow for the restoration of the landscape to reflect local form and character.</i>
WB1: Protected Species	Beneficial: <i>Any specific requirements will be addressed through planning consent.</i>
WB2: Sites of International Importance	Beneficial: <i>Site adjacent to Deeside and Buckley Great Crested Newts SAC. No direct effects and additional habitat creation, together with 21 Year Management Plan agreed with CCW.</i>
WB3: Statutory Sites of National Importance	Beneficial: <i>Site adjacent to Deeside and Buckley Great Crested Newts SAC. No direct effects and additional habitat creation, together with 21 Year Management Plan agreed with CCW.</i>
WB4: Local Sites of Wildlife and Geological Importance	Neutral: <i>The site is identified within the register of sites of local importance. There will be a short term effect which will be mitigated by the long term restoration and aftercare programme.</i>
WB5: Undesignated Wildlife Habitats, Flora and Fauna	Beneficial: <i>Any requirements will be met through planning consent.</i>
WB6: Enhancement of Nature Conservation Interest	Beneficial: <i>Restoration proposals provide scope for enhancement of biodiversity.</i>
HE8: Recording of Historic Features	Beneficial: <i>Any requirements will be met through planning consent.</i>
AC13: Access and Traffic Impact	Beneficial: <i>Any requirements will be met through planning consent.</i>
MIN4: Restoration and After Care	<i>Scheme includes for restoration and aftercare following landfill operations.</i>
EWP6: Managing Waste Sustainably	Beneficial: <i>The site has been included within the UDP as a preferred area of search with the potential for waste management use. Any specific requirements of the policy would be met through conditions attached to a planning consent.</i>
EWP7: Control of Waste Development and Operations	Beneficial:
EWP9: Reusing Development Waste	Beneficial:
EWP11: Pollution	Beneficial: <i>Any requirements will be met in agreement with relevant statutory organisations.</i>

Policy Topic	Impact / Comment
EWP12: Nuisance	Beneficial: <i>Requirements will be met through planning consent.</i>

5.5 Conclusion

The majority of policy objectives show a **Beneficial** impact in terms of the scheme proposals. A few policy objectives show a **Neutral** impact. These relate primarily to loss of existing vegetation and related short term effects. Importantly the scheme includes a landscape restoration and aftercare programme which mitigates the overall effect of these impacts. Although the site abuts part of the Deeside and Buckley Great Crested Newts SAC, the proposals allow for a substantial area of habitat creation to complement the SAC requirements, together with a 21 Year Management Plan. Accordingly, those policies relating to nature conservation have been given a Beneficial impact level. Overall therefore, the scheme shows a **Beneficial** impact in terms of Policies and Plans.

6.0 LANDSCAPE AND VISUAL IMPACT

6.1 Introduction

The location of the site is identified within Figure 6.1 and an aerial photograph of the site and its immediate surroundings is shown in Figure 6.2. The aerial photograph was taken prior to 2002 and quarrying operations have continued beyond this date. The extent of recently disturbed areas within the site has been roughly indicated within Figure 6.2.

The scope of this assessment deals with the potential visual impacts of the proposals and illustrates this through the production of photomontages from a series of principal viewpoints. The assessment also looks at the potential for landscape impacts, including impact on tree cover and the landscape pattern and character of the site and its surroundings.

The assessment takes note of proposals for highway improvements to the A55 and A494, in the immediate vicinity of the site. These significant highway works are currently undergoing public consultation but, if approved, have the potential to affect the extent of landfill proposals on the site and visibility of the operations. This assessment seeks to identify the potential landscape and visual impacts that may arise from the current preferred highway option.

6.2 Planning Context

In order to understand the local planning policy context relevant to the site, reference has been made to the Flintshire County Council UDP, deposit draft Sept. 2003. The principal policies relevant to landscape issues on the site are outlined below:-

TWH1: Tree and Woodland Protection:

This policy provides protection to specific trees or tree groups either within conservation areas or covered by specific Tree Preservation Orders (TPO). The site does not lie within a conservation area and there are no TPOs relating to the trees on or bounding the site. The existing tree belts around the edge of the quarry do make a significant contribution to the screening of the quarry workings and have an amenity value within the wider landscape setting. For this reason, there is a significant benefit in their retention.

TWH4: Woodland Planting and Management:

Proposals for new woodland planting and management will be supported provided that, the planting respects the topography and character of the existing landscape and incorporates existing features into a suitable landscape design. New woodland should reflect the pattern of existing native woods and their species composition and should be managed to allow public access, where appropriate.

L1: Landscape Character:

New development must be designed to maintain or enhance the character and appearance of the landscape. This policy seeks to ensure that new development takes into consideration features within the landscape, which make up its character and local distinctiveness. The policy states that all landscapes are potentially of equal importance,

including degraded land on the urban fringe, although the emphasis here would be on enhancement.

WB3 Statutory Sites of National Importance

This policy states that where a specific proposal would impact directly or indirectly upon a statutory site of national importance, it must be demonstrated that the site features meriting designation would not be detrimentally affected. The site includes a designated Site of Special Scientific Interest (SSSI./SAC) within the southern part of the site and provides breeding habitat for Great-crested Newts (GCN). The landfill proposals exclude the area of the SSSI/SAC and an assessment of the ecological impacts are included under Chapter 11 of the Environmental Statement.

EWP7 Control of Waste Development and Operation:

Proposals for new waste management facilities will be permitted provided that certain criteria are met. The key landscape criteria are that the development does not detract from the natural beauty of the Clwydian Area of Outstanding Beauty (AONB), the Dee Estuary or Halkyn Mountain. The development should also not detract from the value of recognised landscape features or sites of nature conservation value.

Measures should be included within the proposals to mitigate adverse impacts of any waste development, including appropriate landscaping and screening. A detailed restoration scheme should be submitted for an appropriate and beneficial end-use.

6.3 Methodology

This assessment has been carried out with reference to the Guidelines for Landscape & Visual Impact Assessment, 2nd Edition, 2002 (referred to hereafter as “the Guidelines”). The assessment included both a desk-based analysis and on-site field study and observation. The desk study involved the collation and review of existing maps and written information about the site and the wider landscape beyond. The main sources of information included;

- Ordnance Survey plans and topographic survey information
- Aerial photographs
- Flintshire County Council UDP 2000 – 2015, deposit draft Sept. 2003
- Landscapes working for Wales – A Landscape Strategy for Flintshire

This information provided the basis for an appraisal of the pattern and character of the site and its surroundings. It served to identify relevant planning policy and special designated areas and highlighted potential receptors of landscape and visual impact.

The visual assessment for the development was carried out through a mix of desktop analysis and observation on site. An initial desk study of the area, with reference to topographic data and aerial photographs, was used to determine the broad zones of visual influence (ZVI), i.e. areas of land that are visually connected to the site. The principal views of the site were determined in the field, with particular emphasis on checking potential visual receptor areas such as public footpaths, principal vehicular routes and residential areas.

Representative viewpoints were identified which were considered to be of particular significance in terms of providing potential views of the site and where development would have the potential to affect the quality and character of existing views. The principal views were agreed in consultation with Flintshire County Council and all suggestions for additional views were checked on site and, where providing significant views of the site, were included within the study.

Photographs of each of the principal viewpoints were taken using a digital camera set to a focal length equivalent to that seen with the naked eye. Where panoramic views are taken, the individual frames are stitched together in accordance with the Guidelines. The OS coordinates of each viewpoint were recorded using a satellite-positioning device.

All photographs have been taken during the summer when trees are in leaf. It is acknowledged that over the winter months, the screening effect of boundary trees would be reduced in some instances.

To create the photomontages, a digital model of the proposed landform was produced for each phase of the landfill operation. Using 3-D modelling software, perspective views of the model are created and can be placed accurately within the photographs. The size and extents of the proposed landform within the photographs is verified by topographically surveying key features within the view. This can then be used, together with digital terrain data, to accurately position the rendered model within each photomontage.

The proposed landform is based on final landfill levels, but does not take into account settlement. As such, the photomontages illustrate a "worst case" situation, whereas some degree of settlement will be likely to take place.

6.3.1 *Assessing Degree of Significance:*

The significance of any given impact relates to the magnitude of the effect and the sensitivity of the location or receptor.

Sensitivity - The sensitivity of individual views will be dependent on:

- The location and context of the viewpoint
- The expectations and occupation or activity of the viewer
- The importance of the view, which relates to the number of people affected and whether it has any special status, appearing in guidebooks, tourist maps, etc.

The most sensitive individuals to visual impact may include:-

Users of public rights of way, whose attention or interest may be focused on the landscape.

Residents of local housing with views affected by the development.

Other less sensitive individuals to visual impact are:-

People travelling through or past the affected landscape in cars or using other transport routes.

People at their place of work whose attention is less focussed on the landscape.

Magnitude - The criteria used to define the magnitude of impacts are:-

High

Total loss of or major alteration to key elements / features / characteristics of the existing landscape or view.

Medium

Partial loss of or alteration to key elements / features / characteristics of the existing landscape or view which may be prominent or substantially uncharacteristic.

Low

Minor loss of or alteration to key elements / features / characteristics of the existing landscape or view which are not prominent and may not be uncharacteristic.

Negligible

Very minor loss or alteration of key characteristics, approximating to the "no change" situation.

6.3.2 Significance of Visual Impact

In assessing the significance of visual impacts, account is taken of the sensitivity and importance of the view and the predicted magnitude of the impact. Impacts may be either adverse or beneficial and are defined as follows:

Major

Where there would be a substantial improvement/deterioration in the existing view.

Moderate

Where there would be a clearly noticeable improvement/ deterioration in the existing view.

Minor

Where there would be a relatively small improvement/ deterioration in the existing view.

Negligible

Where there would be a barely perceptible improvement/ deterioration in the existing view.

Neutral

Where there may be alteration to certain features within the view, the beneficial and adverse outcomes roughly equating to a neutral situation.

6.4 Baseline

6.4.1 Landscape Character

A Landscape Strategy for Flintshire was prepared in 1996, commissioned by a steering group headed by the Welsh Development Agency. The remit was to define a vision for the County's landscape and to establish a strategic framework for the management of change, based on inherent characteristics of the local landscape. The document identified 12 landscape character areas within the County and defined the characteristic features and qualities for each area. The document goes on to identify strategic measures for improvement and management of the landscape aimed at enhancing local distinctiveness.

The site lies within Character Area No. 5, Buckley Lowland Hills, an area characterised by undulating hills of rolling pasture and divided by shallow, often dry valleys with a

patchwork of mixed woodland. The area includes some industrial land uses around Buckley, which have degraded the urban fringe. The Landscape Strategy supports the planting of new broadleaved woodland, especially as shallow valleys and on hill slopes to reinforce the existing mosaic of mixed farmland, hedgerow trees and narrow woodland blocks.

The site lies on the fringe of Character Area No. 4, Eastern Lowland Plain to the north. This is a more gently undulating pastoral lowland landscape and one that is affected by local infrastructure pressure. The area is characterised by abundant hedgerow trees and an historic settlement pattern. The Strategy identifies priorities specific to the restoration of sand and gravel works, which should reflect local landscape character, create a range of wildlife habitats and provide open space opportunities.

The site itself is clearly a degraded landscape as a result of on-going quarrying operations. Significant excavations with engineered slopes and spoil heaps dominate the central area of the site. Historically, the site was agricultural fields with brickworks later introduced within the southern part of the site and immediately to the north. The site currently has a strong sense of enclosure through the tree belts that line the edges of the site but the quarry workings have created an irregular topography within the central area that is entirely alien to the wider landform and landscape character.

Landscape Designations

Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC):

A SSSI/SAC lies to the immediate south of the quarry, within the site boundary. It forms part of the *Buckley Claypits and Commons SSSI* and part of the *Deeside and Buckley Newt Sites SAC*. This is a composite site located around the northern and eastern boundaries of Buckley. The designated areas are of special interest for the population of great crested newt *Triturus cristatus*, its assemblage of widespread amphibian species, and for its mosaic of semi-natural grassland.

The landfill proposals are restricted to the areas outside the SSSI/SAC boundary and the proposals are designed to preserve and protect the designated SSSI/SAC. An assessment of the potential impacts on the SSSI and other ecological interests is included within chapter 11 of the Environmental Statement.

Clwydian Hills Area of Outstanding Natural Beauty (AONB):

The edge of the Clwydian Hills AONB lies approximately 7.5 kms to the south west of the site, as illustrated within Figure 6.3. The Clwydian Range forms an undulating chain of hills running north-south and is characterised by open heather moorland along the high ridge grading into small fields and woodland along its lower slopes. The Offa's Dyke National Trail follows the crest of the ridge and the area is a popular destination for walkers.

No significant views of the site were identified from the AONB. This was partly due to the distance from the site and also the fact that the site slopes down from its south west corner towards the north east of the site. As a result, the internal part of the site tends to be well screened to views from the south west.

Topography

The site lies along the edge of the lowland hills that mark the southern part of Flintshire. The hills are generally rounded and comprise millstone grit deposits with areas of boulder clay. The landform is generally undulating and often smooth and uniform, illustrating the effects of glaciation. Isolated rounded hills can be clearly seen within the topographic analysis in Figure 6.4, giving way to the flatter lowland flood plain towards the River Dee. The narrow valley along the course of Wepre Brook can be seen to the north and west of the site.

The topography within the immediate vicinity of the site climbs in a broadly north south direction with a general change in level of about 8m across the site. The land rises steeply to the south of the site towards Buckley but falls to the north towards the river valley, before rising again to Northop Hall.

The quarrying activities within the site itself have created a series of deep depressions that leave a substantial impact on the local landform. A bund lines most of the edges to the operational quarry area, varying between about 1 and 5m in height, and with the existing tree belts, largely screens local views into the site.

Site Landscape Features

Quarrying activities occupy the majority of the site, as indicated on the aerial photograph within Figure 6.2, however some significant landscape features remain.

An informal belt of mature trees with a shrub understorey runs along the western boundary of the site (refer to Figure 6.10 for photograph). The height and density of the belt varies along its length, but in places is several metres deep with the most mature trees reaching approximately 10-12 metres in height. The belt forms effective screening of the current mining activities when the trees and vegetation are in leaf, and the trees also make a significant contribution to the character of Pinfold Lane. NB a small section of this tree belt will be removed for the creation of the enhanced site entrance. However replacement tree planting at the corner of the site adjacent to the A494 and the former site entrance will more than compensate for their loss.

A further belt of trees and understorey lines the eastern edge of the site, where this meets the line of the former railway (refer to Figure 6.9 for photograph). The height and maturity of the trees varies but the most mature trees are approximately 10-12m in height. The tree belt and bunding along the eastern edge of the site, screen views of the quarry operation from the adjacent hotel car park and service area.

The SSSI/SAC to the south of the site forms a component of the 99.7 hectare *Buckley Claypits and Commons SSSI*, which is characterised by a mosaic of vegetation, including grassland, a herb layer, scrub and woodland, which together with waterbodies form a rich habitat.

Two large de-watering ponds have been formed within the operational quarry area. The larger of these within the north west corner of the site was observed being used for fishing, although not with permission.

Public Footpaths

There is currently no public access into the site. Along the eastern edge of the site, a dismantled railway line passes between the site and the A55 Services area. This is not presently a formalised footpath route, although it has the potential to be so and to link into the wider footpath network to the south. The route currently provides an informal pedestrian connection between the services and the residential properties to the south, connecting out onto the A494 near the southeast corner of the site.

A right of way lies beyond the site to the west, connecting onto Pinfold Lane near the entrance to the site. This route is not evident on the ground due to the adjacent quarrying activities, which appear to have rendered the footpath impassable.

Visual Analysis

Local views into the site are highly restricted due to the screening effect of the tree belts and bunds that line the perimeter of the site, although the industrial premises immediately to the north of the site do have close views of the existing quarrying operation (Figure 6.5).

The boundary with Pinfold Lane is lined by a belt of mature trees and under-storey. This provides an effective screen to views from passing vehicles, although since these are deciduous trees, glimpsed views into the site will be possible over the winter months from some locations. Industrial premises lie beyond the northern edge of the site, accessed from Pinfold Lane and these have clear and close-up views into the site.

The boundary to the A494 is lined with tall mature trees and totally screens views into the site. The corner of the site at the junction with Pinfold Lane is defined by a raised bund that is unplanted, allowing potential views of an elevated landfill proposal. View 1 illustrates the visibility from this location.

The eastern edge of the site is buffered to the A55 Service Area by a wide tree belt and bunding along the line of the disused railway line. This effectively screens views from the Services and the informal footpath along this edge of the site.

The tree belts significantly screen visibility into the site from the wider area and significant views into the site are restricted to the more elevated ground to the north and west. The clearest views are available from Northop Hall, 1.5km to the north of the site, where the exposed quarry face is clearly visible from the road running through the village. To the south east, the land rises towards Ewloe (1km away), which affords elevated views towards the site. The trees around the edge of the site screen views into the internal area of the site.

More distant views are possible from the higher ground to the west of the site. The site of the hill fort at Rhosesmor (6.7km to the west) provides panoramic views towards the Dee Estuary and the existing quarry face within the site can just be made out from this distance. Panoramic views are also available from the higher ground to the south but the tree planting along the southern boundary of the site restricts views into the internal part of the site.

The Clwydian Hills AONB lies to the south west at a distance of approximately 7.5km. On a very clear day, the site may just be visible from some locations within the AONB,

however, there are unlikely to be views of the site from where the landfill proposals could be readily perceived. There will be no significant impact on the AONB.

Principal Viewpoints:

A number of views have been identified and photographed which are representative of both the local and wider views of the site. Figure 6.8 identifies the locations of the views and the existing and photomontage views are illustrated within Appendix 6.3. The views identified are:-

View 1: A494 junction with Pinfold Lane looking east

This view is taken from the A494 approaching the A55 at the junction with Pinfold Lane. The site lies immediately ahead, beyond the bund that lines the edge of the site. Most of the site boundary is lined with mature trees, although a gap in the tree belt has the potential to reveal the changing landform that would arise from the landfill proposals.

The existing quarry access lies close to the junction along Pinfold Lane but would move further down the lane as part of the landfill development.

View 2: Pinfold Lane looking south

This view is taken from Pinfold Lane on approaching the northern end of the site. A small group of industrial premises lie at this end of the site and can be seen in the left hand side of the view. Mature trees line the edge of the site to Pinfold Lane and these screen views into the site. Pinfold Lane is currently a minor road, although potential highway alterations to the A55, involving Pinfold Lane may ultimately lead to far greater use.

View 3: Northop Hall looking south east from the B5125

The B5125 is the main road running through Northop Hall. The village lies on an area of elevated land to the north west of the site and at this section of the road, views open up towards the site. There are clear views into the site and the exposed quarry faces are clearly visible as a major disturbance to the pattern of the landscape. The view is characterised by a gently undulating landform incorporating agricultural fields, linear woodland and hedgerows trees. The settlement of Ewloe Hall is visible on the ridge beyond the site.

View 4: View from just off Smithy Lane looking north west

This view is taken from just below the houses that line the edge of Ewloe Hall, adjacent to Smithy Lane. The view looks down towards the site across the A494 and beyond the farm buildings and terrace of housing that lines the road. The mature belt of trees that follows the eastern edge of the site screens views of the internal part of the site and the higher ground to the north west can be seen in the distance on the skyline.

View 5: Moel y Gaer Hill Fort, Rhosesmor looking east

The location of the old hill fort provides panoramic views over the undulating plain, which feeds down to the Dee Estuary, visible in the left hand side of the view. The view looks eastwards towards the site across a landscape of irregular fields and hedgerows interspersed with settlements. The linear tree groups merge to suggest a greater woodland cover than is actually the case.

View 6: Waun y Llyn Country Park looking north from the viewing area

The viewing area lies at the end of the ridge looking north and gives open panoramic views towards the Dee Estuary. The Padeswood Cement Works is a prominent landmark and the settlement of Buckley can be seen stretching across the middle ground.

The site lies beyond Buckley to the left of the power station chimneys visible in the background. The site itself is barely visible, although the quarry to the east of Ewloe can be more clearly made out, lying on the higher ground to the south of the site.

6.5 Development Proposals

Indicative Landfill Proposals:

The site is currently working as an operational quarry and would continue to do so, extracting further material to create the voids for the proposed landfill operation. It is proposed that the quarrying and landfill operations would be carried out in tandem, with landfill cells created and filled sequentially over a 16 year timescale (assuming one year for site preparation).

The proposed phasing of landfill operations is illustrated within Figure 6.6. This would comprise of a series of phases whereby the quarried voids would be filled. It is proposed that the site would be divided into 4 cells and that these would be excavated and filled in turn. A first cycle of landfill would fill the voids to the approximate level of the surrounding land. A further cycle of landfill phases would create the final proposed landform, which would appear as a rounded hill covering most of the site, but excluding the area of the SSSI/SAC.

Restoration of the landfill site would be carried out sequentially as each phase of the landform is completed. The indicative restoration planting is illustrated within Figure 6.7 and is designed to create a matrix of grassland and woodland planting. The aim is to create a restored site that reflects the character of the surrounding landscape. It is envisaged that trees would be planted as transplants and for the purposes of the photomontages, these are illustrated as 10 years post-development, i.e. semi-mature.

A55 / A494 Highway Improvement Proposals:

A recent public consultation has taken place over proposals for highway safety measures relating to the A55 and A495 within the vicinity of the site. Appendix 6.2 illustrates the options being considered. The red roads represent the Welsh Assembly's current preferred option which would also need to include the infrastructure shown brown and the widening of Pinfold Lane up to the junction at the quarry access (shown blue).

The remainder of the blue roads and roundabouts and the purple route are 2 options to deal with safety issues along the A494. One of these options may be carried out as a further phase of work. The brown link across the top edge of the pond within the quarry site would only be needed if the purple route was selected.

From discussions with the Welsh Assembly, it has been suggested that a decision will be made on a recommended highway scheme by the end of 2006. On the basis that there are no unforeseen delays, it has been suggested that construction on the highway

project might commence in 2010 and that a construction period of about 2 years would be required to complete the project.

6.6 Impact Description

Landscape Effects:

Landscape effects derive from changes in the physical landscape, which may give rise to changes in its character and how this is experienced. This may in turn affect the perceived value ascribed to the landscape. The potential landscape effects that have been identified are:-

- The impact of the development on the tree cover on the site
- The impact of the removal of existing water bodies on the site
- The impact on the landscape character of the wider area of the proposed new elevated landform.

Visual Effects:

The assessment of visual effects describes the changes in the character of the available views resulting from the development and the changes in visual amenity. A range of visual receptors could potentially be affected by the development and these are identified as follows:-

Motorists using the local road network with passing or distant views of the site:

- Views from the A494 as this approaches the site
- View from the northern end of Pinfold Lane
- Filtered views into the site at points along Pinfold Lane
- Views from the B5125 at Northop Hall

Walkers using public footpaths with elevated views of the site:

- Views from the elevated land to the west at Rhosesmor
- Views from the higher ground to the south at Waun y Llyn Country park

Occupants of residential properties that afford elevated views of the site:

- Views from the housing at Northop Hall to the NW
- Views from the houses on the edge of Ewloe Hall to the SE
- Local views from Oak Farm to the south on Pinfold Lane

Workers or visitors to local industrial / commercial premises:

- Views from the industrial buildings and rear yards of the properties adjoining the northern boundary of the site

6.7 Mitigation

The purpose of mitigation is to avoid, reduce and where possible, remedy or off-set any significant negative adverse effects on the environment arising from the development. Mitigation measures can be either primary or secondary.

Primary measures form part of the iterative design process and are intrinsic to the development proposals. Secondary measures are designed to specifically address the negative effects of the final development proposals.

The mitigation measures that have been identified for the development are:-

- a) Location of the landfill site to the north of the SSSI/SAC allowing the operation to be carried out without direct disturbance to the designated area.
- b) The maintenance of a minimum 30m buffer between the edge of the site and the area to be landfilled. This will minimise the impact on the trees lining the edge of the site. It is recommended that additional in-fill and under-storey planting is introduced in selected areas to reinforce the screening effect of the existing tree belts, particularly along Pinfold Lane.
- c) A 4m high screen fence will be erected along the northern boundary to screen the development from the adjoining industrial premises.
- d) The phasing of the above-grade landfill has been designed to minimise the visual impact of the working faces to views from Northop Hall. Early restoration of the first phase of above-grade landfill will provide significant screening of later phases.
- e) Through a phased landfill operation, discrete cells are able to be filled and temporarily grassed to reduce the visual impact of the on-going operation before final restoration.
- f) The adoption of shallow 1:20 slopes at the top of the proposed final landfill to create a more naturalized domed landform that can integrate into the surrounding setting.
- g) New tree planting as part of the restoration proposals can be used to integrate the new landform into the surrounding landscape and reflect the wider landscape character.

6.8 Residual Impacts

Landscape Effects:

Tree Cover:

The landfill proposals have been designed to occupy the areas of the site currently disturbed by the existing quarrying operation. A minimum 30m distance is maintained between the edge of the landfill cells and the site boundary, which accommodates the haul road and the perimeter tree belts. As such, there should be no loss of existing perimeter trees as a result of the development. There will be loss of a small area of semi-mature birch trees to make way for the enhanced site entrance. There will be ample scope for tree planting around the south west corner of the site and between the SSSI/SAC and the new landfilling area which will more than offset any losses.

The indicative restoration planting includes significant new areas of woodland that would widen and strengthen the existing tree cover on the site. Overall, the proposals would

lead to an almost doubling of the area of tree cover on the site, which would be significant in local terms. It is recommended that woodland planting should be predominantly broadleaved and should include native species, the composition to be agreed with the Countryside Council for Wales (CCW).

Water bodies:

The landfill operation would remove one of the de-watering ponds and reduce the size of the other to leave a smaller storm water management pond in the north western area of the site. Both of the de-watering ponds have steep engineered slopes with little marginal vegetation and have limited ecological or landscape value. The retained storm water management pond has the potential to become a more valued feature as part of the long term restoration of the site. By creating shallower bank profiles and establishing marginal vegetation, the pond could make a far greater contribution to the landscape diversity on the site.

Landscape Character:

The existing quarry operation currently defines the character of the site through its process of extraction and earth moving, creating a high level of disturbance within the internal area. The landfill proposals will be carried out alongside the on-going quarrying activity and will lead to similar levels of disturbance over the course of its operation. The main effect on landscape character will arise in the latter stage of the development when the new elevated landform becomes apparent and is visible within the context of the surrounding landscape.

The final landform will appear as a dome-shaped hill, visible above the tree line surrounding the site. It will be most clearly perceived from the higher ground at Northop Hall to the north west and from the elevated ground to the south east.

The surrounding landscape is characterised by a pattern of undulating fields and hedgerows or narrow woodland belts. Low rounded hills form part of the surrounding topography and the proposed landform will mimic these. The tree belts around the edge of the site screen the steeper slopes and it is only the gently domed upper part of the landform that will be visible. The proposed landform can be successfully accommodated within this landscape setting. The additional woodland planting, introduced as part of the indicative restoration planting, will help to break down the scale of the landform and reflect more closely the scale of local field patterns.

On completion of the site's restoration, it is assessed that the impact on landscape character will be neutral. There are potentially significant benefits in terms of creating public access to the site. This would need to be balanced with protection of ecologically sensitive areas within the site, but could potentially create a significant new area of public open space.

Visual Effects:

The visual effects of the development are assessed in relation to specific viewpoints for which photomontages have been created. The locations of the viewpoints are illustrated within Figure 6.8 and the existing and photomontage views within Appendix 6.3. The visual effects are summarised within the table in Appendix 6.1.

Principal Viewpoints:

VIEW 1: A494 junction with Pinfold Lane looking east

This view illustrates the visibility of the site to motorists approaching on the main road. Referring to the photomontage in Appendix 6.3, the red outline of the proposed landform illustrates that from this location, it will be entirely screened by the existing trees within the left hand side of the view. The visual impact is assessed as **Negligible**.

VIEW 2: Pinfold Lane looking south

Looking south down Pinfold Lane towards the north west corner of the site, a group of mature trees screen views directly into the site. As illustrated by the red outline within the photomontage, the new landform will remain entirely screened from the road by the industrial building and the existing trees. The visual impact is assessed as **Negligible**.

VIEW 3: Northop Hall looking south east from the B5125

The photomontage illustrates the restored site that can be seen as a gently domed landform emerging from the surrounding tree cover. From this location, the new landform keeps within the existing skyline and appears sympathetic to the wider topography within the view. The proposed woodland planting around the edge of the mound helps to integrate the landform into its setting and this will continue to mature and break up the scale of the grassed mound over time. The visual impact is assessed as **Moderately Beneficial**.

There will of course be a temporary visual impact during the landfill operation. The most visually significant phases of the operation are likely to be Phases 6, 7 and 8, when the elevated landfill of cells 4, 1 and 2 takes place (refer to Figure 6.6). The existing quarry faces are already visible at present, but the landfill faces will be higher and therefore more prominent. To address the visual impact of the exposed landfill faces, it is proposed to undertake the above-grade landfill of cell 4 first and carry out restoration works before proceeding with above-grade landfill of the remaining cells. In this way, the completed cell 4 will provide a "greened" landform to partially screen the remaining landfill operations from Northop Hall. Given the temporary nature of the impact, and the proposed mitigation, the visual impact is assessed as **Minor Adverse**.

VIEW 4: View from just off Smithy Lane looking north west

This representative view from the elevated land to the south east of the site provides an attractive outlook across agricultural fields towards distant views of the hills in the background. The photomontage illustrates that the top part of the restored site will be visible above the tree line as a gently undulating landform. It will slightly break the skyline and obscures part of the higher ground in the distance, however, the proposals introduce an area of raised ground which appears sensitive to the local topography and landscape pattern and will not appear out of place within its setting. The visual impact is assessed as **Neutral**.

There will be a temporary impact during the landfill operation when unrestored areas of the mound will be visible. This will take place during Phases 6 and 7 (see Figure 6.6) when the operation is visible above the tree line. The proposal is to carry out restoration works as each phase is completed so only part of the landform will appear disturbed at any one time. Given the temporary nature of the effect, the visual impact is assessed as **Minor Adverse**.

VIEW 5: Moel y Gaer Hill Fort, Rhosesmor looking east

Within this distant elevated view, the existing quarry face can just be made out beyond the trees on the edge of the site. Following the landfill operation, more of the site will become visible but in the context of the view, it will be barely more prominent than the existing workings. After restoration, the site will blend into the wider pattern of hedgerows and rolling fields that characterise the landscape and will be barely noticeable. The visual impact is assessed as **Negligible**.

VIEW 6: Waun y Llyn Country Park looking north from the viewing area

This distant view from the south gives panoramic vistas towards the Dee Estuary. The site can hardly be made out beyond the settlement of Buckley and makes no impression on the view. The final landform is slightly more visible but from this distance, has very little impact and will blend completely into its surroundings. The visual impact is assessed as **Negligible**.

Views from Residential properties:

There are no significant views from the few residential properties within the immediate vicinity of the site, although the buildings at Oak Farm, approx. 500m to the south up Pinfold Lane, look down onto the site. The gable end of the farm house faces the site with a single 2nd floor window. The property will have views of the landfill operation in much the same way as it looks into the quarry at present.

A number of properties at Northop Hall will have views of the landfill site, mainly from 2nd floor windows. The nature of the views will be similar to that illustrated within the photomontage for View 3. There is expected to be a temporary deterioration in views during the later phases of the landfill operation, but the restored site will ultimately provide a beneficial visual impact.

The other properties with significant views of the site are those on the edge of Ewloe Hall. The rear of a number of houses face towards the site and afford views similar to that shown in the photomontage for View 4. The working landfill will be visible during part of the later phase of the operation resulting in a temporary deterioration in views. The restoration proposals, however, can be expected to restore the quality and character of the view.

Views from Industrial Premises:

The rear yards of two industrial premises lie immediately beyond the northern boundary of the site. These areas are used for commercial vehicle parking, storage and general servicing and already have views of quarrying operations on the site. It is proposed to erect a 4m high screen fence along the northern boundary of the site that will largely screen views of the development from the industrial area. It is possible that there may be some glimpsed views of the above-grade landfill operations, but overall, the screening will reduce the visual intrusion of the site on the industrial premises. Hedge planting along the exterior of the screen fence would help to soften the impact of the fence to views from the industrial area.

Implications of A55 / A494 Highway Improvement Proposals:

The Welsh Office's preferred option for the highway improvements would have a number of implications for the landfill development on the site. These have not been assessed in

detail, but are highlighted as matters for consideration once more firm proposals for the highway works are established.

- The widening of Pinfold Lane, as currently proposed, would require the removal of a significant width of the tree belt along the western edge of the site. This would seriously compromise the screening effect of the trees to Pinfold Lane. Additional screening would need to be provided in the form of screen fencing or bunding and replacement tree planting.
- Some of the proposed highway infrastructure could potentially take part of the development site. In these circumstances, the landfill development would need to be revised to accommodate a suitable buffer area and screening between the roads and the development.
- The proposals for a new road bridge over the A55 to the north of the site would create potential views into the development site. The visual impact of a possible future landfill site would need to be considered as part of the highway proposals and appropriate screening provided.

6.9 Conclusion

Planit EDC Ltd has undertaken a landscape and visual assessment of landfill proposals for the Parry's Quarry site. This was based on a landfill design prepared by AMEC Earth and Environment UK Ltd.

An analysis of the visibility of the site indicated that locally, it was very well screened by existing tree belts lining most of the perimeter of the site. There are currently close views into the site from the industrial premises on the northern boundary, but these can be mitigated by screen fencing along this boundary.

The significant views of the landfill development will be from elevated areas, principally, from Northop Hall to the north west of the site and from the edge of Ewloe Hall to the south east. More distant views are available from the higher ground to the south and west, but at distances of 7-8 km, the impact of the development will be negligible.

Views from Northop Hall look down into the existing quarry, which can be seen clearly from the main road through the village. During part of the operational phase of the development, the exposed faces of the landfill will appear more prominent than the existing quarry faces. This can be partially mitigated by progressive restoration of the landfill and the adverse impact on existing views will be minor. The final restoration will have a moderately beneficial impact on the view.

Views of the site from the edge of Ewloe Hall are currently screened by the tree belt along the site's eastern edge. Large parts of the operational phase will continue to be screened, although during the later phases of landfill, it will become visible above the tree line. This will have an adverse impact on the quality of the view, although, given the temporary nature of the impact this is assessed as of minor significance.

The proposed landfill development will not directly impact on the existing tree belts around the perimeter of the site, which will be retained. The indicative restoration

proposals include significant new tree planting which has the potential to greatly increase the tree cover on the site.

The restored site will create a new elevated landform, enclosed by linear tree belts around the edge of the site. The landform will be perceived as a gently rounded hill that is sympathetic to the wider undulating landscape and the pattern of fields and hedgerows trees. The final proposals will not adversely affect the local landscape character.

The restored site has the potential to make a significant contribution to local amenity through allowing public access and the creation of a footpath network on the site. This should be considered as part of the detailed restoration plan for the site.

7.0 HYDROLOGY AND HYDROGEOLOGY

7.1 Introduction

This section deals with the hydrological and hydrogeological aspects of the Parrys Quarry site, including:

- Background climatological data
- Geology
- Groundwater occurrence, characteristics, levels and quality
- Environmental background
- Site water management

7.2 Assessment Methodology

As with other potential impacts resulting from the proposed landfill at Parry's Quarry, those relating to the water environment are defined and characterised by the relationships between potential sources (impacts) and the nature of those features that might be affected by those impacts (receptors). The magnitude of the potential impact is a function of the severity of the impact itself, its intrinsic hazard, the ability of the impact to affect a receptor (pathway) and the sensitivity of the receptor.

If a potential impact is expected to be significant, mitigation measures are adopted to minimise the impact. These are designed to leave a residual impact which is acceptable in the context of the controlling regulations.

It is not the function of an environmental assessment to define in detail the mitigation measures – this will be an objective of subsequent detailed design and assessment – but to identify what they might comprise and verify that they are achievable in the context of practicability and best practice.

Impacts are defined for both the construction and operation phases of the landfill. Closure and post-closure are also addressed in outline. Mitigation and environmental management would be further defined in the site Environmental Management Plan (EMP) and the various specific plans associated with the EMP such as a Water Management Plan, and defined monitoring and auditing.

The principal objectives of environmental management with respect to water are:

- Keep 'clean' water and contaminated (or potentially contaminated) water separate at all times;
- Where discharges of water to the outside environment (including to groundwater or to the surface water system) are necessary, these should be in accordance with appropriate consents and permits;
- If discharges cannot take place because of contamination levels in excess of those permitted, then on-site treatment must be carried out to ensure compliance, or

alternative methods of management and disposal must be adopted (e.g. off-site treatment of excess landfill leachate).

7.3 Baseline Conditions

The baseline information is derived from a number of sources, principally:

- Report on the site by Hafren Water for Hanson Brick (*Assessment of the potential impact on the water environment due to the extension of Parrys Quarry, near Buckley in Flintshire*), March 2001 (see Appendix 7.1)
- Landmark Envirocheck Report (see Appendix 7.2)
- Amec site investigation carried out in July 2006

The general background hydrological and geological setting is as described by Hafren Water (*Assessment of the potential impact on the water environment due to the extension of Parrys Quarry, near Buckley in Flintshire – Draft Version 2, March 2001*) in their report for Hanson Brick. This is repeated here for convenience (and with acknowledgement to Hafren Water).

Hafren Water carried out an investigation comprising:

- Four monitoring boreholes drilled around the perimeter of the site to depths up to 87 m to base elevations around +30 m OD. One or two monitoring installations were completed in each borehole.
- Hydraulic conductivity determined from variable head and injection tests
- Monitoring of groundwater levels and analysis of samples from boreholes and Alltami Brook
- Drilling of additional boreholes and carrying out of pumping test

Details of these boreholes and test data are contained in Appendix 7.1. Results are incorporated into the following sections as appropriate, integrated with the results of the July 2006 investigation.

7.3.1 Hydrology

The site lies within the catchment of the River Dee which is situated approximately 3.5 km to the north-east. The nearest watercourse to the site is Alltami Brook which flows around the west of the site and then approaches to within 250 m of the northern site boundary. Alltami Brook converges with Wepre Brook 900 m to the north-east of the site, which then flows eastwards and north-eastwards to the River Dee about 4 km north-east of the site.

The Environment Agency (EA) classify the Wepre Brook as follows, over the section from the Alltami confluence to the tidal limit (dates are latest information published on the EA website):

- Nutrients, 2002-2004 (phosphorus) 3 (moderate – 0.06-0.1 mg/l P)
- Nutrients, 2002-2004 (nitrates) 2 (<10 mg/l NO₃)

- Biology, 2003 - B (good – little short of unpolluted)
- Chemistry, 2002-2004 - A (very good – supports all abstractions, very good *salmonid* fisheries, *cyprinid* fisheries, ecosystems are natural)

Table 7.1 below summarises some of the water chemistry information for the Wepre Brook.

Table 7.1 Wepre Brook Water Quality Below Alltami Confluence, 2002-2004

Determinand	Average	Standard deviation
Biochemical oxygen demand (mg/l)	1.36	0.77
Ammonia (mg/l N)	0.049	0.058
Dissolved oxygen (percentage saturation)	108.24	11.63
pH (pH units)	8.09	0.211
Hardness (mg/l CaCO ₃)	331	
Dissolved copper (µg/l)	2.54	0.8
Total zinc (µg/l)	21.44	17.19

Source: Environment Agency website

7.3.2 Rainfall

Rainfall data for the nearest raingauge to the quarry were provided to Hafren Water by the EA. This data is summarised in Table 7.2. Moel y Crio station is at NGR 3194 3699 about 8.8 km to the north-west.

Table 7.2 Average Monthly Rainfall

Average rainfall (mm), Moel y Crio 1982-2000												
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
75	52	70	63	61	75	51	78	83	98	95	95	896

7.3.3 Discharges and other consents

The Landmark Envirocheck Report (Appendix 7.2 refers (p6)) to the active discharge consent held by Parrys Quarry for dewatering 'contaminated surface water' to the Alltami Brook via a drain, together with a similar consent from Brock Quarry some 200 m to the north-west between Pinfold Lane and the Alltami Brook. There is also a consented discharge of treated sewage effluent to the Alltami Brook some 500 m to the south-west.

There are no surface water abstractions recorded in the vicinity from the Envirocheck Report.

7.3.4 Flooding

The quarry is outside the vicinity of the Alltami Brook which may be vulnerable to flooding (Envirocheck Report flood map).

7.3.5 Incidents

There have been two significant pollution incidents within 1000 m of Parrys Quarry recorded by the Envirocheck Report (p9). One related to animal carcasses from Gell Farm 500 m to the north-west in 1992, and the other was a deliberate discharge of creamery waste 800 m to the south-west in 1991.

7.3.6 Regional geology

Parry's Quarry is located within a large outcrop of Carboniferous Coal Measures strata. The Coal Measures are overlain unconformably to the east by the Triassic Sherwood Sandstone Group and underlain by Carboniferous Millstone Grit and Limestone which outcrop to the west. The quarry itself and its relevant surrounds lie wholly within the Coal Measures.

The structure is complex due to the degree of faulting in the region, mostly trending north-northwest.

The stratigraphy and lithology of the relevant Coal Measures strata is shown in Table 7.3.

7.3.7 Local geology

The local geology was interpreted by Hafren Water from the British Geological Survey (BGS) 1:10,000 scale geological map SJ26NE and from BGS Technical Report WA/88/2, *Deeside (North Wales) thematic geological mapping*.

The solid geology is overlain by Glacial Till to the north, west and east of the site. To the north the till comprises a brown sandy clay with sandstone fragments and averages 2 m in thickness.

Parry's Quarry is excavated mainly within a downthrown section of Coal Measures strata. Two faults delimiting the quarry 'block' trend north-westerly and north-easterly, intercepting about 300 m north of the site. The western fault runs approximately adjacent to the western quarry face, and the eastern fault is situated approximately 100 m east of the dismantled railway that forms the eastern site boundary. A third fault, downthrowing to the east, is inferred from borehole data at the site and trends approximately north-south roughly in line with the eastern quarry face.

Coal Measures strata dip at angles of 12-15° to the east-northeast.

The western third of the quarry is excavated into mudstones, siltstones and sandstones of the Ruabon Marl (Buckley) Formation. The central and eastern parts are underlain by the Buckley Sandstone. The Bettisfield Formation underlies the areas east and west of the quarry, beyond the marginal faults, with the Hollin Rock sandstone to the west.

The lower mudstones of the Ruabon Marl (Buckley) Formation comprise the economic brickmaking material at the site, especially the unit known as the Buckley Fireclay or Buckley Blue. This unit has a typical thickness of 10 m, and is itself overlain by a sandstone horizon of similar thickness.

Table 7.3 Geological Succession

Age	Formation	Unit	Description
Carboniferous (Westphalian C)	Ruabon Marl (Buckley) Formation	(General)	Maroon, reddish brown, yellow and grey mottled silty mudstones, seatearths and sandstones. Mudstones are blocky, fractured clay to stiff, silty clay.
		Buckley Sandstone	Large sandstone unit occurring towards the base of the Buckley Formation. White, grey and greenish hard, fine-grained quartzose or softer feldspathic sandstone.
		Buckley Blue	Purple, black and grey marl and mudstone.
Carboniferous (Westphalian B and C)	Bettisfield Formation (Productive Coal Measures)	(General)	Cyclical sequence of grey to dark grey mudstones, clays and siltstones with interbedded sandstones, seatearths and coals. Mudstones predominate.
		Hollin Rock	Moderate to strong, yellow-brown to grey and white, fine- to coarse-grained feldspathic, quartzitic sandstone. Described by BGS as being heavily fractured with many of the fractures being infilled with clay.
		Gwespyr Sandstone	

7.3.8 Coal mining

Mining activities in the area are reported on by the Coal Authority and their report to Hafren Water is also attached for convenience to this report as Appendix 7.1.

Two shafts are shown on the geological map and the Coal Authority confirms their position in the extreme south-west of the site (Buckley Colliery Elm Pit shafts nos. 1 and 2). It is reported that both are sealed, one in 1956 to an unknown specification and the other in 1980 presumably to the Coal Authority specification.

The Coal Authority report that the site is within the area of influence of shallow mine workings. As a result the site may be affected by subsidence due to workings beneath or close to the site.

Data obtained by Hafren Water during a visit to the Abandoned Mines Records Office indicates that there was a third shaft about 50 m to the west of the site (Buckley Colliery Elm Pit shaft no. 3). The shallowest workings worked from here are reported to be in the Hollin seam approximately 60 m below ground level, or about +60 m OD, including beneath the southern part of the Parry's Quarry site. The underlying Brassey (or Quaker) and Main seams were also worked from the Elm Pit shafts, extending beneath the majority of Parry's Quarry at depths around -18 m OD.

All coal working was completed and abandoned by 1934. During working groundwater levels were controlled by pumping.

7.3.9 Site investigations

Hafren Water's report of March 2001 contained details of two boreholes constructed in 1996 and four of their own boreholes constructed in 2000, summarised in Table 7.4. The three 2001 pumping and observation boreholes (PQ14-16) do not have any construction details. Geological logs for the 1996 and 2000 boreholes are provided in Appendix 7.1.

Table 7.4 1996 and 2000 Site Investigation Boreholes – Locations (eastings and northings Estimates from Hafren Water Map Figure 7)

Borehole ID	Easting	Northing	Standpipe Level	Ground Level
PQ2/96	327615	366679	110.46	110.23
PQ4/96	327752	366444		111.21
PGW1/00	327811	366466	110.15	109.84
PGW2/00	327516	366266	114.38	114.02
PGW3/00	327489	366648	96.22	96.22
PGW4/00	327767	366727	103.57	103.19
PQ14/01	327661	366547	108.53	108.14
PQ15/01	327621	366592	115.24	114.92
PQ16/01	327721	366426		104.52

These boreholes are shown on Figure 7 of Hafren Water's 2001 report for Hanson Brick. Table 7.5 summarises the geology and construction of the 1996 and 2000 boreholes. Of these boreholes only PGW1/00 survives.

Table 7.5 1996 and 2000 Site Investigation Boreholes – Construction

Borehole ID	Total depth (m)	Generalised lithology	Interval below ground (m)	Interval above sea level (m)	Groundwater response zone (m asl)
PQ2/96	62	Topsoil Mudstone Sandstone Siltstone and mudstone Sandstone and silty sandstone Siltstone Silty sandstone Mudstone	0-0.3 0.3-21.3 21.3-22.2 22.2-29 29-36.4 36.4-55 55-58.7 58.7-62	110-109.7 109.7-88.7 88.7-87.8 87.8-81 81-73.6 73.6-55 55-51.3 51.3-48	100-48
PQ4/96	50	Sandstone Siltstone and mudstone Sandstone Siltstone and mudstone, coal @ 28.5 Sandstone Siltstone and mudstone	0-8.9 8.9-18.8 18.8-22 22-36.6 36.6-41.4 41.4-50	111-102.1 102.1-92.2 92.2-89 89-74.4 74.4-69.6 69.6-61	101-61
PGW1/00	79	Soil and brick Till Mudstone Silty sandstone Mudstone, traces of coal @ 43 Mudstone/sandstone Very hard sandstone	0-1 1-3 3-33 33-41.5 41.5-44 44-78 78-79	110-109 109-107 107-77 77-68.5 68.5-66 66-32 32-31	90-31
PGW2/00	87	Clay and rubble Siltstone and mudstone Silty sandstone Mudstone with sandstone bands Mudstone, traces of coal	0-1.5 1.5-44 44-50.5 50.5-85.5 85.5-87	114-112.5 112.5-70 70-63.5 63.5-28.5 28.5-27	86-76 73-27
PGW3/00	73	Ash and rubble fill Silty mudstone Silty sandstone Mudstone, coal @ 23 Mudstone and sandstone Mudstone and siltstone 'very fast water inflow, no returns'	0-2 2-9 9-15 15-27 27-70 70-71 71-73	96-94 94-87 87-81 81-69 69-26 26-25 25-23	81-21
PGW4/00	75	Soil and clay Siltstone Silty sandstone Mudstone and siltstone Sandstone Mudstone and siltstone Mudstone	0-0.5 0.5-7.5 7.5-9 9-36 36-39 39-63 63-75	103-102.5 102.5-95.5 95.5-94 94-67 67-64 64-40 40-28	95-93 67-28

The site investigation carried out by Amec in 2006, involved sinking a total of nine boreholes by rotary open hole and core recovery drilling, to depths between 10 and 55 m, at locations as shown on Figure 7.1. Surveyed locations are shown in Table 7.6 and borehole logs are attached as Appendix 7.3, together with a diagram of the standard installation. The casing of SBH5/06 was subsequently destroyed by site plant, while that in SBH6/06 has slipped about 1 m probably due to bridging when backfilling.

Table 7.7 summarises the geology and construction of the 2006 boreholes.

Table 7.6 2006 Site Investigation Boreholes - Locations

Borehole ID	Easting	Northing	Standpipe Level	Ground Level
SBH1/06	327684.36	366764.15	99.36	99.28
SBH2/06	327534.61	366565.20	99.05	99.06
SBH3/06	327602.30	366623.19	104.06	104.05
SBH4/06	327768.60	366575.06	106.00	106.15
SBH5/06	327533.25	366322.80	-	112.28
SBH6/06	327767.95	366396.38	109.35	110.66
SBH7/06	327689.68	366425.61	93.81	93.73
DBHA	327688.63	366763.32	99.28	99.30
DBHB	327690.93	366421.92	94.20	94.14
PQW1/00	327809.94	366443.08	110.03	109.75
(2000 survey)			110.15	109.84

Table 7.7 2006 Site Investigation Boreholes – Construction

Borehole ID	Total depth (m)	Generalised lithology	Interval below ground (m)	Interval above sea level (m)	Groundwater response zone (m asl)
SBH1/06	17	Mudstone and siltstone	0-17	99-82	88-82
SBH2/06	10	Made ground (marl, clay, mudstone) Siltstone	0-9 9-10	99-90 90-89	95-89
SBH3/06	15	Made ground (marly mudstone) Mudstone and siltstone	0-1.7 1.7-15	104-102.3 102.3-89	95-89
SBH4/06	10	Sandstone	0-10	106-96	105-96
SBH5/06	26	Made ground (hardcore, mudstone, gravel) Siltstone and mudstone Fractured black shale and coal Mudstone	0-11.2 11.2-22.1 22.1-23.7 23.7-26	112-100.8 100.8-89.9 89.9-88.3 88.3-86	96-86.5
SBH6/06	25.5	Mudstone Sandstone Mudstone	0-2 2-11.3 11.3-25.5	110-108 108-96.7 96.7-84.5	94-85
SBH7/06	10	Clay Siltstone Clay Sandstone	0-3 3-5.9 5.9-6.3 6.3-10	94-91 91-88.1 88.1-87.7 87.7-84	90-84
DBHA/06	55	Mudstone and siltstone	0-55	99-44	22-55
DBHB/06	45	Mudstone Sandstone Mudstone Sandstone Mudstone	0-13.2 13.2-17.4 17.4-34 34-39.5 39.5-45	94-80.8 80.8-76.6 76.6-60 60-54.5 54.5-49	15-45

Overall the various site investigations confirm the dominance of mudstone and siltstone lithologies below the site, with some sandstone at or near the surface, particularly in the eastern/central part of the site (PQ4/96 and SBH4/06). No voids were encountered

related to previous coal operations with the possible exception of PGW3/00 at 71 m depth (25 m asl), possibly related to the Brassey or Main seam.

During the 2006 Amec investigation, samples were taken for geotechnical testing and water analysis, and falling head tests were carried out for permeability estimation.

7.3.10 Hydrogeology

Regional

The Carboniferous Coal Measures comprise a large, anisotropic, heterogeneous system controlled by the aquifer properties of the sandstones and mudstones, and affected by faulting and fracturing which can either augment the hydraulic connectivity and facilitate connection between permeable horizons, or act as partial barriers to flow where they are infilled.

The natural flow regime can be modified by the presence of mine shafts and interconnecting mine workings.

The EA designate the Coal Measures as a Minor Aquifer. Well-developed sandstone horizons within the overall sequence are regarded as individual aquifers. In the 1:100,000 scale Groundwater Vulnerability Map for West Cheshire (Sheet 16) Minor Aquifers are defined as *variably permeable and can be fractured or potentially fractured rocks which do not have a high primary permeability, or other formations of variable permeability including unconsolidated deposits. Although these aquifers will seldom produce large quantities of water for abstraction, they are important both for local supplies and in supplying base flow to rivers.* The Parrys Quarry site and surrounds are given as Minor Aquifer with soils of low leaching potential overlain by low permeability, non-water bearing drift deposits (see Groundwater Vulnerability Map in Envirocheck Report, attached as Appendix 7.2).

The EA website does not indicate any groundwater source protection zones in the area.

Local

The Glacial Till is assumed to have generally low hydraulic conductivity and low effective porosity and will therefore inhibit recharge to the underlying Coal Measures where it is present.

The Buckley and Hollin Rock (and other) Sandstones have some potential to transmit and store groundwater, although they are unlikely to have significant primary (porous) permeability and groundwater transmission and storage is likely to be controlled mainly by the fracture and joint system. The storage potential of the sandstone in the centre and east of the site is limited due to its limited thickness. However, thicker sequences to the south and west may have a higher potential storage.

The Ruabon Marl and Bettisfield Mudstones are likely to have low or very low primary permeabilities and effective porosities. However, the presence of thin siltstone and sandstone horizons may provide localised higher permeabilities, and together with fractures and joints may increase the bulk hydraulic conductivity of the strata.

The faulting in the area may inhibit groundwater flow due to clay gouge and infilling, hence each fault block may behave in a compartmentalised manner except where 'punctured' by old mine shafts and coal workings at depth. Coal workings may also have increased local permeabilities due to collapse and subsidence.

During the Hafren Water site investigation significant groundwater ingress into the monitoring boreholes was apparent. This, and the need for significant dewatering when coal mining operations were active, suggest that overall permeability is low and that there is no significant rapid groundwater pathway out of the system.

Aquifer properties

Hafren Water carried out some permeability testing in 2000 which is reported in their 2001 report for Hanson Brick. Results from testing indicate a bulk hydraulic conductivity for the Coal Measures strata in the range 2.5 – 4.4 m/d based on pumping tests at PG14/01 at around 1.4 L/s (maximum drawdown of 0.59 m).

Falling head tests in PGW2/00 provided a hydraulic conductivity of 0.08 m/d, and an injection test in PGW3/00 gave a range between 0.02 and 0.5 m/d.

Falling head tests were carried out in the 2006 boreholes (and the surviving 2000 borehole PQW1). Data and plots are contained in Appendix 7.4. Initial borehole recovery times were generally quite rapid and the response to the volume of water added was probably concentrated in the gravel pack around the borehole screen rather than the aquifer itself. Nevertheless, using Cooper's method as described in *Analysis and Interpretation of Pumping Test Data (Kruseman and de Ridder, 1990)* the transmissivities for boreholes SBH1, SBH2, SBH6, SBH7, PQW1, DBHA and DBHB are all in the range 5-25 m²/d, giving a hydraulic conductivity in the range 0.05 – 5 m/d, with five out of the seven tests in the range 0.1 – 0.6 m/d. This is consistent with the results obtained by Hafren Water in 2000. The range will be a function mainly of fracture density and distribution within the competent mudstones and sandstones within the Coal Measures.

No test was possible in SBH3 (recovery too rapid), SBH4 (borehole dry or unreliable data), or SBH5 (borehole destroyed at surface).

Groundwater levels and flow

Groundwater levels taken during the falling head test programme are contained in Appendix 7.4 with the falling head test data.

Between the 4 and 14 August 2006 when the testing was carried out, rises or falls in rest water level of up to 0.03 m were observed in general, although in DBHA (the deepest borehole) the level dropped by 0.06 m between 11 and 14 August. This would reflect the depth of this borehole and the more confined conditions monitored. Although there is no single day when all borehole levels were measured, a reasonable snapshot can be determined around 10 August. Table 7.8 illustrates groundwater elevations in the boreholes at that time.

The general background groundwater gradient is around 15 m across the site from south to north, from around 102 m asl to 87 m asl in about 500 m, equivalent to 0.03. This is reasonably steep and reflects the generally low permeabilities of the Coal Measures strata. Since the confluence between the Alltami and Wepre Brooks is at about 70 m asl a further 900 m or so to the north, this suggests a hydraulic continuum with groundwater in the Coal Measures providing baseflow to the Wepre Brook.

The two pairs of boreholes (SBH1/DBHA and SBH7/DBHB) show a slight downward vertical gradient based on level differentials of 0.18 and 0.08 m respectively, indicating some downward migration of recharge waters through the system towards the Wepre Brook.

Table 7.8 Groundwater Levels, c 10 August 2006

Borehole	Datum (casing) elevation (m asl)	Groundwater level (m below datum)	Groundwater elevation (m asl)
SBH1	99.36	10.37	88.99
SBH2	99.05	4.56	94.49
SBH3	104.06	12.60	91.46
SBH4	106.00	10.56	95.44
SBH6	109.35	9.33	100.02
SBH7	93.81	1.39	92.42
DBHA	99.28	10.47	88.81
DBHB	94.20	1.86	92.34
PQW1	110.03	13.96	96.07

The two dewatering ponds are clearly influencing groundwater levels at SBH3 (water level in the north-west dewatering pond at 91.1 m) and SBH7 (central dewatering pond at 92.2). Monitoring of these and other boreholes together with pond levels and dewatering rates would provide another permeability estimate.

Groundwater abstractions

There is a licensed groundwater abstraction for a water bottling plant located about 1.6 km to the north-east of Parry's Quarry (Envirocheck Report p11). This abstraction is from a 50 m deep borehole, probably in the Gwespyr Sandstone. The abstraction lies outside the fault block occupied by Parrys Quarry and is unlikely to be on the same flow path as groundwaters beneath the quarry.

Groundwater quality

Groundwater samples from the available boreholes were taken on 4 August 2006 and analysed for major mineral ions, heavy metals and other parameters. The results are attached in Appendix 7.5 and summarised in Table 7.9 below.

Table 7.9 Groundwater Quality, 4 August 2006

Borehole	SBH1	SBH2	SBH3	SBH6	SBH7	DBHA	DBHB	PWQ1
pH, pH units	8.30	7.90	7.99	8.15	8.33	8.37	8.22	8.31
Conductivity, $\mu\text{S/cm}$	639	933	1468	1291	790	640	1039	819
BOD, mg/l	<1	13	13	<1	<1	109	<1	<1
Total suspended solids, mg/l	910	1600	4570	1205	230	9720	692	130
Ca, mg/l	80	130	211	162	90	85	130	96
Mg, mg/l	23	4.2	53	45	34	20	38	34
Na, mg/l	15.0	43.5	43.5	40.5	33.8	30.0	36.8	24.0
K, mg/l	2.4	3.9	13.1	10.5	10.1	3.8	8.9	7.2
NH ₃ -N, mg/l 0.5	<0.2	3.9	<0.2	<0.2	0.8	0.6	0.5	0.6
NO ₂ , mg/l	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.07	<0.05
NO ₃ , mg/l	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Alkalinity as CaCO ₃ , mg/l	242	105	415	255	280	260	320	255
Cl, mg/l	19	78	71	82	29	50	39	35
SO ₄ , mg/l	117	266	332	306	123	83	192	137
Fe, $\mu\text{g/l}$ 200	78	62	20	63	66	355	46	90
Mn, $\mu\text{g/l}$ 50	809	35	1008	66	145	1001	720	131
Cd, $\mu\text{g/l}$	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Cr, $\mu\text{g/l}$	1	<1	<1	5	<1	<1	<1	<1
Cu, $\mu\text{g/l}$	<1	<1	<1	<1	<1	<1	<1	<1
Pb, $\mu\text{g/l}$	<1	<1	<1	14	<1	<1	<1	<1
Ni, $\mu\text{g/l}$	4	21	9	<1	<1	18	2	<1
Zn, $\mu\text{g/l}$	11	7	<3	5	<3	6	5	6

The groundwaters are generally characterised as follows:

- Neutral-slightly alkaline pH
- Moderate to very high hardness (between 300 and 750 mg/l total hardness as CaCO₃)
- High concentrations of calcium, magnesium, bicarbonate alkalinity and sulphate which cause the hardness and characterise the waters as mainly calcium sulphate in type with secondary calcium bicarbonate and magnesium sulphate. These concentrations result principally from dissolution of minerals such as gypsum and anhydrite in the rock matrix of the Coal Measures strata, a process enhanced by the low bulk permeabilities and increased resident/contact time between groundwater and the rock matrix.

- Very high concentrations of iron and manganese, and low concentrations of non-ferrous heavy metals
- Very low concentrations of nitrite and nitrate, and low-moderate concentrations of ammoniacal nitrogen

For context and illustration, concentrations exceeding the UK drinking water standards are distinguished by red entries in Table 7.9. The principal parameters exceeding these limits are sulphate, ammonia and manganese, with occasional iron.

The most highly mineralised groundwaters (based on conductivity) are from SBH3 and SBH6, and the lowest from DBHA and SBH1. There is no particular relationship between mineralisation and location – it might be expected that downgradient waters would be more concentrated due to longer residence times – and the distribution is likely to be dependent on localised characteristics of permeability and rock matrix characterisation.

7.4 Principals of Water Management for the Site

The reader is referred to the Design Statement prepared by Amec Earth and Environmental which accompanies the planning application documentation for additional details regarding water management at the site.

The principal objectives of environmental management with respect to water are:

- Keep 'clean' water and contaminated (or potentially contaminated) water separate at all times;
- Where discharges of water to the outside environment (including to groundwater or to the surface water system) are necessary, these should be in accordance with appropriate consents and permits;
- If discharges cannot take place because of contamination levels in excess of those permitted, then on-site treatment must be carried out to ensure compliance, or alternative methods of management and disposal must be adopted (e.g off-site treatment of excess landfill leachate).

Separating clean water from 'contact' water is a matter of minimising ingress of water into the operation by diversion of watercourses around the site; and by provision of appropriate sumps and storm water storage to enable the water that cannot be diverted to be at least partially clarified by settling prior to discharge (subject to any quality conditions attached to the discharge permit). Groundwater from dewatering may also fall into this category, especially from dewatering via boreholes rather than just by use of excavation and sumps.

When landfill is in process, there will inevitably be some clean water, mainly rainfall, that will enter the fill material and contribute to the generation of leachate in the waste. Leachate generation should be minimised, at least for hydrological reasons, and the IPPC landfill permit may require it to be managed so that there is no more than 1 m of saturated waste at the base of any active cell. Excess leachate will either need to be treated to an appropriate standard and discharged, or removed from the site by tanker (or to foul sewer if available and consented). When the cell is completed, capping and contouring should take place as quickly as possible to minimise further ingress.

Some leakage from any engineered liner should be allowed for as a contingency. This should be kept separate from any clean water and treated and/or removed from the site as appropriate.

The base of the landfill will be below the water table/piezometric surface, and so dewatering/depressurisation will be required to prevent upward pressure causing the liner to heave and possibly destroy its hydraulic integrity. The following subsection discusses possible conceptual options for dewatering.

It is desirable to develop a water balance and water management plan for the operation. This will enable the water system to be proactively planned and managed rather than reacted to when something goes wrong. A key part of the water balance is a full understanding of the meteorological and climatological regime, including the likelihood of extreme events. This would allow for robust sizing of water management infrastructure such as diversion channels and storage/settlement ponds, and also closer management of leachate generation.

The Hafren Water report for Hanson Brick in 2001 considered the implications of deepening the quarry to a maximum depth of 35 m asl. As part of this, they estimated likely groundwater inflow volumes for a range of depths and assumed bulk permeabilities.

For a permeability of 0.5 m/d (about the middle of the range encountered in the falling head tests) Hafren Water calculated that deepening the quarry to 70 m would result in inflows of 2141 m³/d (24.8 l/s) on average. At 60 m this figure would increase to 3435 m³/d (39.7 l/s). The highest bulk permeability considered was 3 m/d which generated estimated groundwater inflows of 7838 m³/d (90.7 l/s) at 70 m floor elevation and 13,167 m³/d (152.3 l/s) at 60 m elevation.

Groundwater levels on the site currently (August 2006) fall from about 102 m asl in the south to 87 m asl in the north. The proposed landfill base level is 82 m. To avoid problems with emplacing and maintaining the engineered landfill liner it will be necessary to dewater the site to an elevation at or just below the base. Because of the low permeabilities and low yields, dewatering to that level may take some time and so would have to start in advance of the liner emplacement. The details of any dewatering scheme would need to be carefully designed but at present there appear to be three main options for dewatering:

- Boreholes
- Excavated sumps
- Both in combination

Boreholes provide more control and can be operated to focus the dewatering effort at the scale and location required at any stage in the operation. They also take up little room, especially if most of them are located around the periphery of the operation, and if the boreholes are properly designed and constructed there should be little problem with suspended solids in the pumped water. On the other hand, they may be more expensive to construct and equip, they consume energy and they need to be maintained.

Excavated sumps clearly work up to a point (the ponds on the site now are carrying out some degree of dewatering as witnessed by the impact on groundwater levels in

adjacent boreholes compared to the regional regime). However, they cannot dewater below the effective base of the quarry and the water levels in the surrounding sections will always be higher. Furthermore, the rate of dewatering in what is essentially a passive system will decrease as the water table falls, and at the end may stabilise without achieving the objective level.

The most effective and efficient way to design and optimise a dewatering scheme is to set up a numerical groundwater model which can be used as a basis for (firstly) a pilot scheme and subsequently a full operational scheme. The model can then be used as a management tool for controlling and focussing the dewatering effort in accordance with requirements at any given time.

It is recommended that investigations into a suitable dewatering scheme commence as soon as possible. The first task would be the geological and structural model which is a prerequisite for a successful conceptual groundwater model. Other major factors are the constraints on borehole location controlled by the landfill design; and the possible restrictions on discharge of the abstracted water.

7.5 Assessment of Potential Impacts

7.5.1 Construction Phase

During the construction phase, water-related impacts and potential impacts will mostly relate to earth-moving activities and the need to keep clean water from entering the site unnecessarily where it might be vulnerable to contamination, especially from suspended solids. Dewatering will be required to prepare the landfill cells and ensure that the adopted basal liner system can be emplaced safely and correctly.

Earth moving activity generates considerable quantities of unconsolidated or loosely consolidated material in newly-laid earthworks, temporary stockpiles etc. In the event of heavy rain significant concentrations of suspended solids can be picked up from these materials and transported in surface drainages to be discharged into the natural surface water system. This would create a negative impact if these suspended solids were then to be deposited on the streambed under lower energy conditions, blanketing feeding areas for aquatic fauna and reducing light levels reaching aquatic flora for example. The impact could be worse if the suspended solids particles also contained chemical or biological contaminants.

It is possible that such suspended solids could also impact groundwater recharge by blocking surface fractures through which water infiltrates. This is very unlikely to be an issue in low permeability strata such as those present at Parry's Quarry, and the main impact would be to reduce permeability at the surface and result in more surface ponding.

The impact of suspended solids can be mitigated by the following:

- Separation of surface drainage from vulnerable source materials as much as possible;
- Diversion of surface water around the site to minimise ingress of clean water to areas where it can come into contact with soil materials:

- Provision of storm water storage/settling pond to regulate discharges off-site and allow some settling out of any suspended material collected.

These mitigating features can be seen on the landfill design drawings shown in Appendix 2.3.

Earthmoving vehicles and other mechanical plant operating on the site can provide sources of contaminating liquids, mostly fuel, lubrication and hydraulic fluids. These can leak from sumps and hydraulic pipes on the vehicles and enter the surface water or groundwater systems. Since they are invariably mineral oils of some description they constitute significant potential contaminants in both surface and groundwaters, even in low volumes and concentrations.

The risk of such losses occurring and presenting an environmental impact can be mitigated and minimised by:

- Ensuring that vehicles and plant are in good condition, clean and subject to regular maintenance, thereby minimising risk of leakages during operation;
- When out of use, vehicles should be stored on hardstanding either with bunds to contain any spillages or a surface drainage system equipped with grit traps and oil separators;
- All fuels, lubricants, hydraulic fluids and other contaminating liquids should be stored in secure bunded areas to contain any spills;
- Site operators should be trained in environmental hazards and awareness so that they can respond quickly and effectively to any potentially impacting event on site (such as a failed hydraulic hose on an earthmoving vehicle).

The natural water table is higher than the proposed base elevation of the landfill. Whilst the landfill liner system will prevent clean groundwater infiltrating into the active landfill cells, the upward pressure will make it impossible to emplace the liner effectively and may continue to cause the liner to lift until there is sufficient loading of waste material to balance it. In these circumstances the liner is more vulnerable to damage which can compromise its integrity and function.

In order to avoid this, the site needs to be dewatered to lower the water table below the landfill base. Provision of dewatering ponds (as exist now) would only result in partial dewatering and would not reduce the water level far enough beneath the liner areas. It is more likely that a network of pumping boreholes would be installed to generate a suitable cone of depression.

Dewatering creates two principal impacts:

- Groundwater table is lowered (the fundamental objective) which may derogate groundwater resources;
- The pumped water needs to be discharged, usually to the surface water environment.

The former, whilst certain to occur, is very unlikely to be an issue (although permitting will be required) due to the low status of the Coal Measures as an aquifer and groundwater resource, and the absence of other abstractions that might be affected. The latter could present similar potential impacts to surface water drainage by way of discharging suspended solids to the receiving stream. This would however be mitigated by proper construction and development (cleaning) of the pumping boreholes so that any suspended material is effectively blocked by the borehole screen and filter pack and the water pumped is clear. Additional clarification and control could be provided via the storm water pond if required.

The following tables (Tables 7.10 and 7.11) specify and summarise the expected impacts and mitigation measures relating to the water environment during the construction phase.

Table 7.10 Water Impact Table - Construction Phase

No	Project Activity	Environmental Sensitivity	Impact	Description	Probability	Value of Receptor	Impact Rating (before mitigation)
WC1	Earthmoving and construction activities	Surface water system (Alltami and Wepre Brooks)	Suspended solids in drainage waters	<ul style="list-style-type: none"> • Negative • Direct • Local • Short term • Reversible 	Low to Medium	High	Medium
WC2	Earthmoving and construction activities	Groundwaters	Suspended solids in receiving groundwaters	<ul style="list-style-type: none"> • Negative • Direct • Local • Short term • Reversible 	Low	Low to medium	Negligible
WC3	Earthmoving and construction activities – plant management	Surface water system (Alltami and Wepre Brooks)	Oils and other organic contaminants reaching surface waters	<ul style="list-style-type: none"> • Negative • Direct • Local • Short term • Reversible 	Low to Medium	High	Medium
WC4	Earthmoving and construction activities – plant management	Groundwaters	Oils and other organic contaminants reaching groundwaters (and possible subsequent baseflow to surface waters)	<ul style="list-style-type: none"> • Negative • Direct • Local • Short term • Reversible 	Low to Medium	Low to medium	Low
WC5	Dewatering	Surface water system (Alltami and Wepre Brooks)	High volume and suspended solids introduced to surface waters	<ul style="list-style-type: none"> • Negative • Direct • Local • Medium-long term (could continue into operational phase) • Reversible 	Medium to high	High	Medium to high
WC6	Dewatering	Groundwaters	Lowering of water table	<ul style="list-style-type: none"> • Negative • Direct • Local • Medium-long term (could continue into operational phase) • Reversible 	High	Low	Low

Table 7.11 Water Mitigation Table and Residual Impacts - Construction Phase

No	Impact	Mitigation	Impact Rating (before mitigation)	Residual Impact Rating (after mitigation)
WC1	Suspended solids in drainage waters	<ul style="list-style-type: none"> • Diversion of natural drainage around the site and minimisation of water ingress • Separation on site of non-impacted and potentially impacted water as much as possible • Provision of sumps and ponds to allow settlement of solids prior to discharge 	Medium	Low
WC2	Suspended solids in receiving groundwaters	<ul style="list-style-type: none"> • Diversion of natural drainage around the site and minimisation of water ingress • Separation on site of non-impacted and potentially impacted water as much as possible 	Negligible	Negligible
WC3	Oils and other organic contaminants reaching surface waters	<ul style="list-style-type: none"> • Proper maintenance of plant • Storage of fuels and chemicals in secure areas with hardstanding and adequate bunding • Management plan and training to enable identification of potential impact whilst plant is operational • Grit traps and oil separators in site drainage and before discharge 	Medium	Low
WC4	Oils and other organic contaminants reaching groundwaters (and possible subsequent baseflow to surface waters)	<ul style="list-style-type: none"> • Proper maintenance of plant • Storage of fuels and chemicals in secure areas with hardstanding and adequate bunding • Management plan and training to enable identification of potential impact whilst plant is operational 	Low	Negligible
WC5	High volume and suspended solids introduced to surface waters	<ul style="list-style-type: none"> • Provision of sumps and ponds to allow settlement of solids prior to discharge • Provision of storage and water management to control discharge regime during sensitive periods 	Medium to high	Low to medium
WC6	Lowering of water table	<ul style="list-style-type: none"> • Localised and focussed dewatering to minimise cone of depression to that required for engineering purposes 	Low	Low

7.5.2 Operational Phase

During the operational phase, all the water-related impacts and mitigations relevant to the construction phase will continue to apply. Earth-moving activities will continue to be a part of operational landfill procedures, and it is likely that dewatering will continue to be required whilst the landfill cells are filled, at least until any upward water pressure on the basal lining is balanced by the loading from above. Accordingly, impacts WO1-WO6 are the same as WC1-WC6.

In addition, there will be other potential impacts relating to the operational landfilling, in particular the generation and management of landfill leachate.

The landfill design (driven by the provisions of the Landfill Directive and its daughter England and Wales regulations) requires the containment of waste and leachate by provision of engineered basal lining systems and associated leachate management infrastructure. This is designed to prevent leachate escaping from the landfill and discharging into the outside water environment, either by infiltration to groundwater or discharge to surface water. The design is therefore the principal mitigation against leachate contamination. In addition, care and close management during construction

through CQA procedures ensures that the landfill is constructed in accordance with the design.

It is possible however that some minor seepages could occur, in which case the design has to incorporate a leakage interception and collection system. Leachate levels in the landfill will also be managed to minimise waste saturation and potential for increased driving pressures through the liner. Any excess leachate would require off-site disposal and/or treatment.

With respect to groundwater, off-site boreholes would be used to monitor groundwater quality and verify that no leachate losses to the groundwater system were occurring. It should also be noted that whilst dewatering is taking place the cone of depression acts as a hydraulic containment system to trap any contaminant seepages that might occur. On completion, capping and restoration minimises further infiltration of water and generation of additional leachate.

The following tables (Tables 7.12 and 7.13) specify and summarise the expected impacts and mitigation measures relating to the water environment during the construction phase.

Table 7.12 Water Impact Table - Operational Phase

No	Project Activity	Environmental Sensitivity	Impact	Description	Probability	Value of Receptor	Impact Rating (before mitigation)
WO1	Earthmoving and construction activities	Surface water system (Alltami and Wepre Brooks)	Suspended solids in drainage waters	<ul style="list-style-type: none"> • Negative • Direct • Local • Short term • Reversible 	Low to Medium	High	Medium
WO2	Earthmoving and construction activities	Groundwaters	Suspended solids in receiving groundwaters	<ul style="list-style-type: none"> • Negative • Direct • Local • Short term • Reversible 	Low	Low to medium	Negligible
WO3	Earthmoving and construction activities – plant management	Surface water system (Alltami and Wepre Brooks)	Oils and other organic contaminants reaching surface waters	<ul style="list-style-type: none"> • Negative • Direct • Local • Short term • Reversible 	Low to Medium	High	Medium
WO4	Earthmoving and construction activities – plant management	Groundwaters	Oils and other organic contaminants reaching groundwaters (and possible subsequent baseflow to surface waters)	<ul style="list-style-type: none"> • Negative • Direct • Local • Short term • Reversible 	Low to Medium	Low to medium	Low
WO5	Dewatering	Surface water system (Alltami and Wepre Brooks)	High volume and suspended solids introduced to surface waters	<ul style="list-style-type: none"> • Negative • Direct • Local • Medium term (could continue through operational phase) • Reversible 	Medium to high	High	Medium to high

No	Project Activity	Environmental Sensitivity	Impact	Description	Probability	Value of Receptor	Impact Rating (before mitigation)
WO6	Dewatering	Groundwaters	Lowering of water table	<ul style="list-style-type: none"> Negative Direct Local Medium term (could continue through operational phase) Reversible 	High	Low	Low
WO7	Landfilling	Surface water system (Alltami and Wepre Brooks)	Landfill leachate contaminating surface waters	<ul style="list-style-type: none"> Negative Direct Local Short-medium term Reversible 	Medium to high	High	Medium to high
WO8	Landfilling	Groundwaters	Landfill leachate contaminating groundwaters (and reaching surface waters indirectly)	<ul style="list-style-type: none"> Negative Direct Local Short-long term Irreversible except in long term 	Medium to high	Medium (protection from List I substances)	Medium
WO9	Landfilling	Surface water abstractions	Landfill leachate contaminating surface water abstractions	<ul style="list-style-type: none"> Negative Direct Local Short-medium term Reversible 	Low (no abstractions referred to in Envirocheck report)	High	Low
W10	Landfilling	Groundwater abstractions	Landfill leachate contaminating groundwater abstractions	<ul style="list-style-type: none"> Negative Direct Local Short-long term Irreversible except in long term 	Negligible (no abstractions in groundwater flow path)	Medium (protection from List I substances)	Negligible

Tables 7.13 Water Mitigation Table and Residual Impacts - Operational Phase

No	Impact	Mitigation	Impact Rating (before mitigation)	Residual Impact Rating (after mitigation)
WO1	Suspended solids in drainage waters	<ul style="list-style-type: none"> Diversion of natural drainage around the site and minimisation of water ingress Separation on site of non-impacted and potentially impacted water as much as possible Provision of sumps and ponds to allow settlement of solids prior to discharge 	Medium	Low
WO2	Suspended solids in receiving groundwaters	<ul style="list-style-type: none"> Diversion of natural drainage around the site and minimisation of water ingress Separation on site of non-impacted and potentially impacted water as much as possible 	Negligible	Negligible
WO3	Oils and other organic contaminants reaching surface waters	<ul style="list-style-type: none"> Proper maintenance of plant Storage of fuels and chemicals in secure areas with hardstanding and adequate bunding Management plan and training to enable identification of potential impact whilst plant is operational Grit traps and oil separators in site drainage and before discharge 	Medium	Low

No	Impact	Mitigation	Impact Rating (before mitigation)	Residual Impact Rating (after mitigation)
WO4	Oils and other organic contaminants reaching groundwaters (and possible subsequent baseflow to surface waters)	<ul style="list-style-type: none"> • Proper maintenance of plant • Storage of fuels and chemicals in secure areas with hardstanding and adequate bunding • Management plan and training to enable identification of potential impact whilst plant is operational 	Low	Negligible
WO5	High volume and suspended solids introduced to surface waters	<ul style="list-style-type: none"> • Provision of sumps and ponds to allow settlement of solids prior to discharge • Provision of storage and water management to control discharge regime during sensitive periods 	Medium to high	Low to medium
WO6	Lowering of water table	<ul style="list-style-type: none"> • Localised and focussed dewatering to minimise cone of depression to that required for engineering purposes 	Low	Low
WO7	Landfill leachate contaminating surface waters	<ul style="list-style-type: none"> • Engineered design in accordance with Landfill Regulations (supported by risk assessment) • CQA of construction process • Proactive leachate management system • Leakage monitoring • Interception of any leakage before it can reach the surface water system • Appropriate disposal and/or treatment of any contaminated leakages • Minimisation of time before capping and restoration of landfill cells to restrict water ingress 	Medium to high	Low
WO8	Landfill leachate contaminating groundwaters (and reaching surface waters indirectly)	<ul style="list-style-type: none"> • Engineered design in accordance with Landfill Regulations (supported by risk assessment) • CQA of construction process • Proactive leachate management system • Leakage monitoring • Minimisation of time before capping and restoration of landfill cells to restrict water ingress • Down gradient groundwater monitoring • Dewatering offers hydraulic containment 	Medium	Low
WO9	Landfill leachate contaminating surface water abstractions	<ul style="list-style-type: none"> • Engineered design in accordance with Landfill Regulations (supported by risk assessment) • CQA of construction process • Proactive leachate management system • Leakage monitoring • Interception of any leakage before it can reach the surface water system • Appropriate disposal and/or treatment of any contaminated leakages • Minimisation of time before capping and restoration of landfill cells to restrict water ingress 	Low	Negligible to low
W10	Landfill leachate contaminating groundwater abstractions	<ul style="list-style-type: none"> • Engineered design in accordance with Landfill Regulations (supported by risk assessment) • CQA of construction process • Proactive leachate management system • Leakage monitoring • Minimisation of time before capping and restoration of landfill cells to restrict water ingress • Down gradient groundwater monitoring • Dewatering offers hydraulic containment 	Negligible	Negligible

7.5.3 Closure and Post-Closure Phase

At closure, the completed landfill will be capped and restored in accordance with the relevant Regulations. Ongoing mitigation activities during post-closure are likely to be

focussed mainly on monitoring. Details for this period will be developed throughout the project life as part of the closure planning process of the EMP.

7.6 Conclusions

Tables 7.11 and 7.13 above describe the magnitude of residual impacts relating to the water environment following the adoption of the proposed mitigation measures. During the construction phase the main potential for impact upon the groundwater and surface water environments will be through the uncontrolled discharge of waters laden with suspended soils and/or the accidental spillage of fuels and oils. These impacts can be readily mitigated by the adoption of standard good practice with respect to plant and equipment maintenance, materials storage and the careful control of runoff, water storage and discharge.

A similar range of potential impacts will apply during the operational phase and adoption of the same mitigation measures as applied during construction will ensure that these impacts are not significant. In addition, during the operational phase, the landfilled wastes will generate contaminated leachate which adds a further potential risk to the groundwater and surface water environments. The risk will be managed by ensuring full engineered containment of the landfilled wastes and close control over leachate volumes generated within the landfill. Leachate will be collected and discharged under controlled conditions to foul sewer.

8.0 TRAFFIC AND ACCESS

8.1 Introduction

This chapter has been prepared to assess the traffic and access issues related to the development of a solid waste landfill site within the registered title boundary of land currently owned by Robin Jones and Sons Ltd off Pinfold Lane, Alltami, Mold, Flintshire.

8.2 Assessment Methodology

The assessment of traffic impacts has been undertaken using guidance published by the Institution of Highways and Transportation 'Guidance for Traffic Impact Assessment'. In line with accepted methodology discussion with the Local Highway Authority, Flintshire County Council, confirmed that the following issues should be considered:

Operation of existing traffic signal controlled junction at A494/Pinfold Lane, Alltami, and

Access into the proposed site off Pinfold Lane.

8.3 Existing Conditions

The proposed site is located off Pinfold Lane alongside the A494 trunk road and is accessed via an existing traffic signal controlled junction. The A494 is a wide single carriageway and forms the link from the A55 expressway to Mold and areas to the west. The A494 joins the A55 at the 'Ewloe Loop', however, access to and from the A55 is limited to eastbound traffic only as the Ewloe Loop Interchange allows only restricted movements. Vehicles wishing to travel westbound have to first travel east to the nearby Ewloe Interchange before joining the A55 to travel west, an additional journey length of some 3km. Vehicles from the west wishing to join the A494 to Mold have to undertake the same detour in reverse.

The A494 is a high standard wide single carriageway approximately 10m wide with 1m strips on both sides. On the immediate approaches to the traffic signals on the A494 the footways have been converted to shared footways/cycleways. The traffic signal layout, however, does not include advance stop lines and cyclists are returned to the carriageway either side of the junction.

The signalised junction includes dedicated right turn lanes and phases for vehicles wishing to turn right off the A494 onto both Pinfold Lane (North) and Pinfold Lane (South). The entry to the traffic signal for Pinfold Lane (North) is only a single lane wide.

Pinfold Lane links the industrial and residential areas north of Buckley with the A55, and crosses the A494 at the existing traffic signals.

The northern section of Pinfold Lane links the A494 with the A55 but has only restricted movements (left in/left out from the A55). As a result vehicle numbers using Pinfold Lane as a link are small. This section of Pinfold Lane (North) crosses a stream over a bridge which is subject to a 7.5T weight limit and, therefore, all vehicles exceeding this weight have to return to the traffic signals onto the A494 to continue their journeys.

Pinfold Lane (North) is approximately 6 metres wide at the site entrance. It also provides access to a number of commercial developments which generate significant volumes of traffic and in particular heavy goods vehicles.

The Local Authority's Alltami Highways Depot is located alongside the A494 and accessed off Pinfold Lane. The access for cars, vans etc is located opposite the site between the existing site entrance and the traffic signals. Goods vehicles and vehicles associated with

the highway maintenance operations use a separate access located some 30 metres north. This access road also provides access to a pump rental business (RAP) and Dawson Rentals (a company that rents articulated lorries). A plant hire company is also accessed off Pinfold Lane (AH Plant Hire).

To the north, Pinfold Lane also provides access to the TDG Logistics depot which generates heavy goods vehicle movements and also a quarry owned by Brock Plc. Further to the north there is a heavy goods vehicle repair business (Deeside Trucks Service for Scania) which generates heavy goods vehicle movements.

To the north of the bridge there are a small number of private houses accessed off Pinfold Lane.

North of the bridge the alignment of Pinfold Lane (North) is poor, both in terms of carriageway width and alignment and is only suitable for cars and light goods vehicles.

Pinfold Lane (south from the traffic signals) is approximately 6 metres wide and provides access to and from the A494 for the industrial estates north of Buckley. Pinfold Lane (South) is also used by landfill traffic en route to and from the existing landfill site at Brookhill operated by A D Waste Ltd. Traffic associated with the landfill site comprises a significant proportion of the total traffic flows on Pinfold Lane (South).

In terms of background traffic, Flintshire County Council confirmed that there was no traffic data available for Pinfold Lane, however, traffic data is available for the A494 as follows:

- i) A494 west of Ewloe – hourly traffic flows averaged between 1 January 2004 and 1 January 2005 providing 12, 16, 18 and 24 hours totals eastbound and westbound.
- ii) A494 west of Ewloe – hourly traffic flows averaged between 1 January 2005 and 31 December 2005 providing 12, 16, 18 and 24 hour totals eastbound and westbound.
- iii) A494 west of Ewloe – monthly summary report 2004 eastbound and westbound.
- iv) A494 at Alltami – 12 hour classified count – 21 September 2004 - 0700 – 1900 hours eastbound and westbound.
- v) A494 at Alltami – 12 hour classified count – 31 May 2002 – 0700 – 1900 hours eastbound and westbound.

This base data has been collated and used to establish the current position on the A494 local to the site.

In addition, automatic traffic counters (ATCs) were installed on Pinfold Lane (North) (immediately north of the existing traffic signals) and north of the access serving the existing Brook Plc quarry and Pinfold Lane (South) (immediately south of the traffic signals) to provide details of hourly flows over the period 1 September to 7 September 2006 and 29 September to 5 October. The ATCs also provided details of vehicle classifications.

Typical daily traffic flows on the existing roads are shown in Table 8.1. The Table shows peak hours and 16, 18 and 24 hour flows (2006).

Table 8.1 Typical Daily Traffic Flows

Road Name	Average Daily Weekday Traffic Flow	16 hour flow	18 hour flow	am peak	pm peak
A494 West of Ewloe	20592	19135	20075	1812	1758
Pinfold Lane (North) South of Access to Council Depot	1631	1556	1584	151	142
Pinfold Lane (North) North of Access to Quarry	925	860	881	89	93
Pinfold Lane (South)	1585	1556	1573	174	150

The ATCs also provided details of the vehicle classifications and these are summarised below in Table 8.2.

Table 8.2 Traffic Flows by Vehicle Type

Road Name	Average Daily Weekday Flow	am peak hour	pm peak hour
A494	20592 (1762) 8.78%	1812 (31) 7.24%	1758 (116) 6.6%
Pinfold Lane (North) South of Council Depot	1631 (511) 31.3%	151 (47) 31.1%	142 (40) 26.6%
Pinfold Lane (North) North of Access to Quarry	925 (260) 28.1%	89 (19) 21.3%	93 (17) 18.3%
Pinfold Lane (South)	1586 (113) 22.1%	174 (41) 23.5%	150 (31) 20.9%

Key: 20000 all vehicles
 (200) HGVs
 % % HGVs

The Welsh Assembly Government's Design Manual for Roads and Bridges Volume 5 Technical Advice Note TA46/97 provides flow ranges for the assessment of new rural roads. Although the Advice Note is primarily intended for use in determining carriageway standards for proposed roads, it does provide a broad assessment of the capacity limitations of existing roads.

TA46/97 suggests a wide single carriageway can economically carry up to 21,000 vehicles per day at opening. This figure allows for future growth to a design year some 15 years after opening. Guidance concerning flows at which congestion is likely to occur is also provided

in the Advice Note and for a wide single carriageway rural road the Congestion Reference Flow (CRF) is approximately 33,000 vehicles per day.

The percentage of heavy goods vehicles using the A494 west of Ewloe (east of Pinfold Lane junction) is approximately 8.78%. A high percentage of heavy goods vehicles in the total flow will reduce the CRF but in this case these percentages are not exceptional.

This being the case it can be seen that the existing A494 falls well within the acceptable flow rates for wide single carriageway roads.

A similar review has been undertaken for Pinfold Lane and TA46/96 indicates that a single carriageway 7.3 metres wide can economically carry up to 13,000 vehicles per day at opening and the corresponding CRF is 23,000.

The percentage of heavy goods vehicles in Pinfold Lane north and south is high reflecting the industrial and commercial businesses served by these roads (generally between 20 and 30%), however, the capacity of these roads is considered to be well in excess of the existing traffic movements.

8.4 Programmed Road Improvements

The Welsh Assembly Government has published proposals for 'A55/A494 Ewloe Interchange with a connection to the A494 to Mold A55 Ewloe to Northop Improvement'. Public consultation took place between 16 May and 11 July 2006. The proposals are aimed principally at resolving congestion problems along the A55 especially at Ewloe Interchange at peak periods. The proposals include for an improved road link between A494 Mold Bypass and the A55 and two options for this were presented as part of the Consultation Exercise.

The two options for the new link between A494 Mold Bypass and A55 would both join the A55 at a new Interchange on the A55 located to the north of the proposed site.

The 'Purple' route would be a new link to the north and would effectively bypass the length of existing A494 between the end of Mold Bypass and Ewloe Interchange (past the site). The proposals show a connection from this new Interchange on A55 to the north end of Pinfold Lane (North) which would provide a replacement route to the A55 from the site. The existing traffic signals at Pinfold Lane A494 would be retained and would only accommodate local traffic with origins and destinations on Pinfold Lane.

The 'Blue' route would also commence at the end of A494 Mold Bypass and would run south and alongside the existing A494 where a new roundabout would provide a high standard link to the site for all traffic except that having local destinations to the south e.g. Buckley, Mold.

There is no programmed date for the construction of these works and they are subject to the Public Consultation Exercise, further design, the publication of Highways Orders and the completion of statutory procedures and the availability of finances from the budgets approved by the Welsh Assembly Government.

Under the circumstances, it is assumed that the programme for implementing these improvements will be outside the scope of this application and the likely reduction in vehicle numbers that would result along the A494 and on Pinfold Lane are ignored for the purposes of this assessment.

8.5 Proposed Development

The proposed development comprises of the landfilling of solid waste of which the majority is anticipated to comprise Municipal Solid Waste (MSW).

The proposed development will be phased over 15 years and waste disposal will commence in 2008.

The proposed project will provide a total of approximately 2,600,000 cubic metres of land fill void and this volume includes deposited waste, and cover material which is required to be placed over the waste.

The justification of the need for the landfill facility and the projected waste volumes are outlined earlier in Section 2.

This predicts that as an upper worst case with respect to traffic volume, input will be 150,000 tonnes of waste per annum over the projected lifespan of the waste facility. As a comparison the Environment Agency's published records for the Brookhill landfill site for 2003/04 and 2004/05 show that the total landfill tonnage of 162420 and 154203 tonnes per annum respectively was disposed of at that facility. The total MSW disposed of in landfill for the year 2004/05 was 100070 tonnes.

On the basis this assessment assumes that 150,000 tonnes of material will be disposed of at the new landfill site each year during its lifespan of which 90,000 tonnes will be MSW and 60,000 tonnes will be commercial and industrial.

Household waste collected in Flintshire by the County Council's contractor A D Waste Ltd, is presently deposited at the Brookhill Landfill Site in Buckley. The collection rounds involve a total of some 12 Refuse Collection Vehicles (RCVs) of which 6 make 3 trips each per day to the landfill site, and 6 make 2 trips. In addition, vehicles that collect refuse in skips from Civic Amenity (CA) sites also make approximately 12 trips per day to the Brookhill Site.

8.6 Existing Landfill Site

The existing landfill site at Brookhill accepts all of Flintshire's domestic refuse as well as commercial and industrial waste and is expected to reach its capacity by mid 2007.

Brookhill is located off the B5127 Ewloe to Buckley road. As mentioned earlier Pinfold Lane (South) is used, by a significant volume of 'landfill' traffic en route to the Brookhill Site and the numbers of HGVs using this road will reduce following the closure of Brookhill.

In order to estimate the times at which trips are made to the proposed landfill the data available for the Brookhill landfill (and the now closed Standard landfill site) has been used as this site is close to the proposed site off Pinfold Lane and, therefore, the times that vehicles enter and leave the proposed site will be similar.

The data from Brookhill and Standard was also used to provide an hourly profile of RCVs entering the landfill site.

Table 8.3 Hourly Profile of RCVs Entering the Landfill Site

Hour	No. of RCVs
0700 - 0800	0
0800 - 0900	1
0900 - 1000	3
1000 - 1100	5
1100 - 1200	5
1200 - 1300	4
1300 - 1400	4
1400 - 1500	8
1500 - 1600	4
1600 - 1700	2
1700 - 1800	0
	36

It can be seen that there was no delivery of domestic waste in RCVs before 0800 and only 1 before 0900. This is understandable as an RCV which commences its first collection at around 0730 hours will not complete it until at least 0900 hours.

Similarly domestic waste collections leave at 1630 hours and there are no deliveries to the landfill after 1700 hours. It can be concluded that RCVs delivering to the proposed site will have no impact on peak hour traffic.

Similarly data for December 2002 (extracted from the Broken Bank Transportation Assessment) has been used to estimate an hourly profile of vehicle trips carrying commercial and industrial waste to the proposed landfill site.

In this analysis the following vehicle numbers were recorded:

- 77 vehicles delivering commercial and industrial waste.
- 19 vehicles delivering same for restoration.
- 11 vehicles delivering waste from CA sites.

and the following table provides a typical hourly profile (excepting domestic refuse i.e. RCVs):

Table 8.4 Typical Hourly Profile of Vehicles Excluding RCVs

Hour	No. of Vehicles
0700 - 0800	14
0800 - 0900	12
0900 - 1000	9
1000 - 1100	11
1100 - 1200	10
1200 - 1300	8
1300 - 1400	13
1400 - 1500	12
1500 - 1600	11
1600 - 1700	8
1700 - 1800	0
	108

When considering both domestic waste (deliveries in RCVs) and industrial and commercial waste it can be seen that trips to the existing landfill are fairly constant throughout the day peaking at around 1300 – 1400 hours, outside the traditional peak periods for network traffic.

Planning permission has been granted for a waste recycling facility on the proposed site and it is likely that this will generate up to an additional 5 trips per day.

8.7 Existing Quarrying Operations

The proposed site is currently an active quarry which produces clay and screened shale for use as fill in the construction industry.

Weighbridge data provided by the operators of the quarrying operations has been used to estimate existing traffic movements for the existing site and to predict the timing of movement and destinations. Weighbridge data has been provided for the period since the new electronic weighbridge has been operational (April 2005) to July 2006. The amount of material deposited in the landfill and hence the numbers of lorry movements depends upon the market at any given time and since January 2006 the quarrying operations have generated only approximately 20 two way movements of heavy goods vehicles per day. The quarrying operations are undertaken between 0700 and 1700 Monday to Friday and 0700 – 1200 hours on Saturdays with no works on Sundays.

The busiest period for which records are available occurred in May 2005 when screened shale was being delivered to a project at Manchester Airport. During this time there were typically 90 two way trips per day from the quarry.

Weighbridge data has been used to produce an hourly profile of vehicle movements during the busiest period of quarry operation as follows (Table 8.5):

Table 8.5 Vehicle Movements for Existing Quarrying Operations

Hour	No. of Trips
before 0700	-
0700 - 0800	12
0800 - 0900	9
0900 - 1000	11
1000 - 1100	9
1100 - 1200	5
1200 - 1300	13
1300 - 1400	9
1400 - 1500	12
1500 - 1600	5
1600 - 1700	2
after 1700	-
	87

With regard to quarry traffic it can be seen that trips are generally evenly spread throughout a typical day with few leaving the quarry during the evening peak hours. Trips tend to commence mid morning and mid afternoon, however, this is very much dependent upon the market destinations for material, travel times etc, however, the above is considered to be typical of a normal day.

8.8 Trip Generation

Flintshire County Council has provided the following information relating to the refuse collection deliveries.

The Council have twelve RCVs operating each day 6 of the RCVs serve the main centres of population within the County, Mold/Buckley/Mynydd Isa (2) Greenfield/Holywell (part), Connah's Quay Flint/Holywell (part) and Saltney/Broughton/Hawarden. These deliveries were to the Brookhill Site 3 times a day Monday to Thursday and with 2 visits on a Friday.

The other 6 RCVs serve the outlying communities and visit the landfill site twice a day. AD Waste, the operators of the Brookhill landfill site, also operate 2 Ro-Ro vehicles which make an average 6 trips to the Brookhill landfill site per day.

From the above it can be assumed that the majority of domestic refuse will approach the proposed site from A494/A55 from the east (assume 60%).

Some waste will be delivered to the site from A494 west (Mold and other areas west) and some from Pinfold Lane (South), (Buckley, Mynydd Isa). For the purposes of this assessment 20% is assumed to be delivered via A494 west and 20% from Pinfold Lane South (Buckley direction).

Waste deposits cannot be predicted with accuracy as although collection patterns for the household element will be determined by the proximity principle (and is likely to be restricted

to arisings from within Flintshire) for commercial and industrial waste this will involve collection from a less defined area.

It is assumed that industrial and commercial waste is likely to follow a similar pattern i.e.60/20/20 – A494 East/A494 West/Pinfold Lane (South).

8.9 Existing Quarry Traffic

Weighbridge data from the existing quarry operation has shown that the vast majority (upwards of 90%) will leave the quarry and turn left onto the A494 for destinations to the east. This is logical as there are numerous, sand and gravel, limestone and hard rock quarries to the west and that these are likely to be in an economically advantageous position for sites located to the west.

For the purpose of trip assignment it is assumed that 90% would have destinations along A494 east, 5% A494 west and 5% Pinfold Lane (South).

8.10 Assessment Years/Growth of Traffic

Highway Access

It is practice to growth network traffic to the future assessment years in order to provide a robust estimate of traffic flows likely to be using the roads and junctions in the local area.

Base traffic flows (2006) have been factored by high growth National Road Traffic Forecasts published by Department of Environment Transport and the Regions (DETR) last updated in 1997. High growth factors were chosen to present a robust estimate of future traffic flows.

The estimated traffic generated by the development was added to growth network traffic to arrive at predicted design year flow.

Predicted traffic flows for the opening year 2008 are outlined below in Table 8.6 and Table 8.7 shows the 'design year flows' with predicted development traffic added.

Table 8.6 Opening Year Flows With and Without Development

Road Name	AADT Flow Without Development	AADT Flow With Development
A494	20934	21048
Pinfold Lane (North) South of Council Access	1691	1881
Pinfold Lane (North) North of Access to Brook Quarry	959	959
Pinfold Lane (South)	1644	1682

Table 8.7 Design Year Flows With and Without Development (2018)

Road Name	AADT Flow With Development	AADT Flow Without Development
A494	24867	24980
Pinfold Lane (North) South of Council Access	2009	2199
Pinfold Lane (North) North of Access to Brook Quarry	1139	1139
Pinfold Lane (South)	1953	1991

Highway Improvements

The existing access to the site will be widened to allow heavy goods vehicles to enter and leave the site at the same time so minimising the potential for vehicles wanting to enter the site having to wait on Pinfold Lane and 'block back' traffic to the signals. The approach to the signals from Pinfold Lane will also be widened to provide a two lane entry at the junction to increase capacity as requested by Flintshire County Council. These proposals are shown on Figure 2.2.

This road widening will require land from the Pinfold Lane and A494 site frontage and will also result in the relocation of the existing splitter island and traffic signal pole on the A494 (east) to provide additional manoeuvring area for long vehicles leaving Pinfold Lane (north) and travelling east, (the manoeuvre that the majority of vehicles make).

The main site roads parking areas and permanent storage areas will be surfaced. Temporary haul roads within the land fill site will not be surfaced and therefore in order to prevent materials e.g. mud and debris from the landfill being carried onto the public highway, the development includes a permanent wheel washing system.

All vehicles that pass through the landfill areas will pass through the wheel wash before leaving the site. The wheel wash will include a combination of physical/or wet cleaning technology to remove debris from the wheels and the underside of vehicles. The condition of the site access will be monitored regularly and additional road sweeping measures will be employed as necessary.

Sufficient car parking will be provided for visitors and staff at designated areas on the site. Access onto the public highway will be kept free at all times.

8.11 Road Safety

Five years accident data was obtained for Pinfold Lane (north) and A494 in the vicinity of the signal controlled information from Flintshire County Council. The classifications of accidents are shown in Table 8.8.

Table 8.8 Summary of Reported Accidents 2002 - 2006

Year	Slight	Severe	Total
2002	1	-	1
2003	-	-	-
2004	2	-	2
2005	1	-	1
2006 (part)	-	-	-

There have only been four 'slight' accidents recorded at the traffic signal controlled junction and its approaches over the past five years.

Two of the accidents involved vehicles failing to stop and running into the rear of vehicles waiting at the traffic lights on the A494.

One accident involved a vehicle overtaking on the A494 and colliding with an oncoming vehicle and one accident involved a motorcyclist skidding on spilt diesel at the traffic signal controlled junction.

These accidents are typical of the type expected at traffic signal controlled junctions and the low number suggests that the current layout does not have any inherent shortcomings which would lead to the potential for more accidents to occur should the development progress.

8.12 Highway Impact

The 'impact' that the introduction of new traffic to an existing road network may have can be assessed in a number of different ways. The aspects most likely to be affected can be examined and possible mitigation measures suggested, if appropriate. Examples of potential impact areas could include such elements as:-

- Existing road users
- Sensitive locations (such as schools)
- Public transport
- Junction capacity.

Relative to the above categories, the potential impacts could include such factors as:-

- Community severance
- Safety, noise and intimidation
- Insufficient public transport provision
- Increased delays with associated safety reduction.

This assessment concentrates upon the possible physical traffic impacts relating to highway capacity and safety issues. Other potential environmental impacts are dealt with elsewhere, by others, within separate 'specialist' report sections covering the pertinent areas of environmental assessment required for the development as a whole.

Appendix 8.1 (Figures 8.1 – 8.3) provides daily weekday traffic flows on the approaches on the A494 to the east of the traffic signals junction with Pinfold Lane (North and South) for 2006, the opening year 2008, and for the design year 2018.

Appendix 8.1 (Figures 8.4 – 8.5) show average annual weekday flows with generated traffic added in 2008 and design year 2018.

From these, it can be seen that the addition of traffic generated from the development to existing background network flows will not exceed the acceptable capacity thresholds for the rural category roads.

The increase in traffic as a result of the development traffic during the 24-hour period is less than 10% at opening on the A494 and is insignificant in traffic terms. The greatest increase of approximately 11% is seen on Pinfold Lane (North) between the traffic signals and the site entrance. The increases on Pinfold Lane (South) is 2%.

The 'Guidelines for the Environmental Assessment of Road Traffic' published by the Institute of Environmental Assessment (IEA) (1992) provides accepted thresholds at which 'impacts' from changes in the magnitude of traffic using a road may be considered as being material.

The 'impacts' that could result include such things as noise, air quality, vibration, community severance, pedestrian amenity, fear and intimidation.

When new developments are planned, it is recommended that an assessment of the period of greatest change be examined in order to establish a likely percentage increase in traffic.

These percentages are then used to establish which roads may require further examination due to the potential for environmental impact'.

'Rule 1' of the guidelines states "include highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%)".

'Rule 2' states "include any other specifically sensitive areas where traffic flows increase by 10% or more". The 'sensitive areas' would apply where the development traffic would all pass by a school, for example, or would use roads that are already heavily congested.

The IEA guidelines provide data based upon previous research into discernable environmental impacts and lists three categories; 'substantial', 'moderate' and 'slight' for changes in traffic flows of 90%, 60% and 30% respectively. In relation to changes in traffic volumes of less than 19% the guidelines state that noise impact (for example) would be 'not perceivable'.

This is because traffic flows on any road can fluctuate on a daily basis (typically by approximately 10%) and so minor variations cannot be readily discerned.

Highway Authorities may request that capacity analysis be carried out if the traffic volume using junctions is likely to be increased by more than 5% by the introduction of development generated traffic. In this case traffic generated by the development is less than 1% passing through the signal controlled junction.

In terms of daily traffic flows the increase resulting from the development are greatest in the short section of Pinfold Lane between the existing traffic signals and the site entrance and the greatest change will occur in the year of opening (i.e. 2008). In the opening year daily flows are estimated to increase by 190 vehicles (an increase of 11.2%) over existing.

It is acknowledged that these additional trips will be by heavy goods vehicles, however, given the short length of road affected (approximately 50 metres) this is not considered to be significant in terms of impact.

The increases on A494, Pinfold Lane north of the site entrance and Pinfold Lane to the south are insignificant in terms of daily traffic flows.

It can be seen, therefore, that the percentage increase in traffic flows resulting from the development on both Pinfold Lane north and south and the A494 is insignificant.

8.13 Construction Period Traffic

The construction of the landfill development will be phased over a number of years and are described earlier.

The nature and programme for the development are such that there will not be a high concentration of construction vehicles visiting the site at any one time.

The landfill will be developed in a number of phases, each phase will be intended to provide 3 to 4 years of landfill disposal capacity through the release of a number of individual cells. Earthworks operations at the start and close of each cell will generate approximately 10 HGV movements per day over a 5-day period.

With respect to the construction of the buildings and roads, hardstandings etc., we estimate that 10 HGVs (carrying for example, concrete, steel etc) would visit the site each day over a 10 week construction period.

From the above, it can be seen that construction traffic associated with the development will be insignificant when compared to network traffic flows.

8.14 Mitigation of Impacts

Construction Phase

Delays and disruption to network traffic during the alterations to the existing traffic signals on the A494 will be mitigated through the contractor working at non-peak periods under suitable traffic management and signing. Advanced signing will be erected in consultation with the Highway Authority to advise road users of the possible delays. No works involving a reduction in road space will take place during the holiday 'embargo' periods. Consultation with local residents and businesses will ensure that delay and disruption to these operations are minimised.

Similarly appropriate traffic management will be employed on Pinfold Lane to ensure that delays and disruption to local businesses are minimal during the works to construct the new site access.

The contractor will employ good working practice to minimise noise and dust generation during these works by only using effluent plant, switching off plant when not in use etc. The existing roads will be kept clean at all times to minimise dust and dirt.

Operational Phase

The construction of the new site access off Pinfold Lane and the improvements to the existing traffic signal controlled junction will ensure that the additional traffic generated by the development will be accommodated without significant impact to network traffic.

8.15 Conclusions

This Transport Assessment has been prepared to assess the impact of the proposed landfill site at Parry's Quarry at Alltami.

The site is well served by the A494 trunk road and Pinfold Lane. The site is located within an industrial area where numerous heavy goods vehicles' movements already occur.

Traffic generated by the facility would in general be evenly spread throughout the day and would not have a significant impact on the operation or capacity of traffic signalised junction which gives access to the site from the A494.

As the impact of the capacity and operation of the traffic signalised junction is insignificant it can be concluded that the impact on the wider road network will also be insignificant and therefore this assessment need not consider any aspects of the road network beyond the site access.

The new facility will offer significant traffic benefits to other areas of the County of Flintshire by virtue of the relocation of the existing landfill sites in Buckley to a more remote location with a result that trips by Heavy Goods Vehicles will be reduced through residential areas.

The waste vehicles that will visit the facilities are in use at the present time, albeit using different routes in order to travel to the landfill sites. As such, within the context of Flintshire these do not represent 'new generated traffic' but are effectively reassigned.

The site is well located to serve the future waste disposal and recycling needs of Flintshire County Council without result in adverse impact upon the surrounding areas from associated traffic.

The Welsh Assembly Government have proposals to improve the link between A494 Mold Bypass and the A55 and both the preferred options which have been the subject of a recent Public Consultation will result in reduced traffic using the existing A494 past the site.

The tables presented in Appendix 8.2 summarise the impacts resulting from traffic generated by the developer and the likely residual impacts resulting from proposed mitigation measures.

9.0 NOISE AND VIBRATION

9.1 Introduction

The noise and vibration assessment considers and describes the existing baseline noise and characterises existing noise sources from noise monitoring undertaken within the vicinity of the site.

Sensitive receptors that could potentially be affected by increased noise levels and vibration due to the construction and operation of the proposed landfill have been identified. The impacts of the development on these sensitive receptors are evaluated using quantitative methodologies wherever possible. A qualitative assessment is given where details of potential noise sources are yet to be finalised.

9.2 Noise Assessment Methodology

9.2.1 Guidance and Legislation

The noise and vibration assessment has been conducted with reference to the following British Standards, National and International Guidance.

Council Directive 1999/31/EC of 26 April 1999 on the Landfill of Waste

Annex I of the Landfill Directive states that "Measures shall be taken to minimise nuisances and hazards arising from the landfill through noise and traffic".

Welsh Office – *Technical Advice Note (TAN) (Wales) 11 (1997)*

TAN11 provides guidance on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development.

Annex B indicates that the main sources of noise from landfill waste disposal sites are generally from vehicle movements, tipping operations and site plant. With this in mind it recommends that appropriate mitigation or planning/licensing conditions should therefore relate to hours of working, the number and/or capacity of vehicles using the site and their points of ingress and egress and the provision of acoustic screening and/or noise limits.

TAN11 refers to BS5228 for information on predicting noise levels from landfill sites.

Welsh Assembly Government – *Minerals Technical Advice Note (Wales) 1: Aggregates (2004)*

This document does not make direct reference to landfill operations. However, given the similarity between the operation of surface mineral workings and landfills, with respect to noise and vibration, the guidance and noise limits contained within MTAN1 should be taken into account.

MTAN1 refers to the Minerals Planning Guidance Note 11 for advice on monitoring and assessment of noise levels. Note that MPG11 has now been revised and re-issued as Minerals Planning Statement 2 Annex 2 (see below).

MTAN1 indicates that the aggregates industry should aim to keep noise emissions at a level that reflects the highest possible environmental standards, taking all reasonable steps to achieve a quieter working environment, through the use of BATNEEC (the best available technique not entailing excessive cost).

Paragraph 88 in MTAN1 states that *"noise limits should relate to the background noise levels, subject to a maximum daytime noise limit of 55 dB(A) where background noise levels exceed 45 dB(A). 55 dB(A) is the lower limit of the daytime noise levels where serious annoyance is caused. Where background noise is less than 45 dB(A), noise limits should be defined as background noise levels plus 10dB(A). Night-time working limits should not exceed 42 dB(A) at noise sensitive properties. Daytime working is defined as 0700-1900 hours and night-time as 1900-0700 hours. Noise limits should be set in terms of $L_{Aeq,T}$ over a 1-hour measuring period. L_{Aeq} is the noise index used to describe the "average" level of noise that varies with time (T) and should be measured "free field" that is, at least 3.5 metres away from a façade to prevent reflections of noise by any façade that faces the noise source. During temporary and short-term operations higher levels may be reasonable but should not exceed 67 dB(A) for periods of up to 8 weeks in a year at specific noise-sensitive properties"*.

MPS 2: 2005 – Controlling and Mitigating the Environmental Effects of Mineral Extraction in England – Annex 2: Noise

MPS 2 Annex 2 offers guidance for both surface mineral extraction and surface operations associated with underground mineral extraction, including waste disposal and recycling operations.

The Annex does not make direct reference to other waste disposal or recycling operations. However, it states that *"these share many operational features with surface mineral operations, waste management operators and waste planning authorities should take account of this Annex alongside Planning Policy Guidance Note 10 (PPG10) Planning and Waste Management"*.

The Annex complements the general guidance in PPG24 and other controls under environmental legislation by:

- identifying the significant effects of noise from surface mineral operations;
- identifying examples of good practice in the control and mitigation of noise emissions;
- stating how the planning system can keep noise emissions within environmentally acceptable limits without imposing unreasonable burdens on mineral operators.

The key planning principle stated within Annex 2 is that noise should, as far as possible, be controlled mitigated or removed.

British Standard (BS) 5228: 1997 – Noise and Vibration Control on Construction and Open Sites

BS5228-1: 1997 offers guidance on assessing the impact of noise and vibration due to activities on construction and open sites. In addition, it provides recommendations for basic methods of noise and vibration control where significant noise and/or vibration levels are anticipated.

Environment Agency: Internal Guidance for the Regulation of Noise at Waste Management Facilities (July 2002)

This guidance applies to landfill site and waste management facilities which fall under PPC regulations and/or are licensed under the Waste Management Licensing Regulations. For IPPC sites, reference should be made to the Horizontal Guidance for Noise (see below).

The guidance covers the control of noise, appropriate noise limits and the overlap with the other regulatory authorities.

IPPC Horizontal Guidance for Noise H3 Part 1 – Regulation and Permitting (Version 3 2004)

This document outlines the main considerations relating to the regulation and permitting of noise.

IPPC Horizontal Noise Guidance H3 Part 2 – Noise Assessment and Control (Version 3 2004)

Part 2: Noise Assessment and Control is aimed equally at regulators and operators. It describes the principles of noise measurement and prediction and the control of noise by design, by operational and management techniques and abatement technologies.

British Standard (BS) 4142: 1997 – Methods for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas

BS4142: 1997 provides guidance on assessing the significance of a noise source. It describes a method, whereby measured or predicted noise levels from a noise source(s) are compared to existing background noise conditions in order to determine the likelihood of complaints from residents within the vicinity of the source. The title of the document implies that the guidance is strictly for industrial developments; however the assessment methodology it recommends is also often used for a wider range of noise sources.

The likelihood of complaints is assessed by subtracting the background noise level (LA90,T) from the rating level (LAeq,T). The rating level is based upon the specific noise level, and includes a correction of +5 dB if the noise source features any tonal or impulse noise. BS4142 states that a difference of +10dB or more between the predicted/measured (with development) and background (without development) noise levels is likely to result in complaints. A difference of around +5dB is of marginal

significance, with a difference of -10dB being a positive indication that complaints are unlikely.

British Standard (BS) 8233: 1999 – Sound Insulation and Noise Reduction for Buildings

BS8233: 1999 provides recommended indoor ambient noise levels for commercial premises. The recommended levels can be seen in Table 9.1 below.

Table 9.1: BS8233:1999, Relevant Internal Ambient Noise Levels in Unoccupied Spaces.

Criterion	Typical Situations	Design Range $L_{Aeq,T}$ dB	
		Good	Reasonable
Reasonable conditions for study and work requiring concentration	Cellular office Meeting room, executive office	40 35	50 40
Reasonable acoustic privacy in shared spaces	Open plan office	45-50	Design range

The design criteria for hotel bedrooms are similar to those for dwellings.

BS8233 also recommends that where windows are opened to allow ventilation, attenuation in the order of 10-15 dB can be anticipated. Assuming a worst-case attenuation of 10dB, this would equate to a satisfactory external level of between 45-60 dB for commercial premises.

In situations where windows are not required for ventilation i.e. mechanical ventilation is provided, noise attenuation level of 25-30 dB can be anticipated. This equates to a satisfactory external ambient level of between 60-75 dB $L_{Aeq,t}$.

World Health Organisation – Guideline Levels for Community Annoyance (1999)

The WHO provides guidelines for assessing the level of community annoyance. These can be seen in Table 9.2 below.

Table 9.2 - WHO (1999), Relevant Guideline Values for Community Noise.

Specific Environment	Critical Health Effect (s)	L_{Aeq} (dB)	Time Base (hours)
Outdoor living area	Serious annoyance, daytime and evening	55	16
	Moderate annoyance, daytime and evening	50	16
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8
Indoor living areas	Speech intelligibility and moderate annoyance for daytime and evening	35	16
Indoor bedrooms	Sleep disturbance night-time	30	8

Highways Agency – Design Manual for Roads and Bridges: Volume 11 – Environmental Assessment (DMRB11)

The Design Manual for Roads and Bridges: Volume 11 (DMRB11) provides procedures for assessing the level of nuisance caused by road traffic-related noise and vibration. Although DMRB strictly applies to new road schemes the procedures contained within the documents can also be applied to an assessment of noise from road traffic in general.

Welsh Office – Calculation of Road Traffic Noise (1988)

CRTN provides a methodology for calculating noise levels from road traffic. The calculation method uses a number of input parameters including traffic flow, average vehicle speed, percentage of heavy good vehicles, type of road surface, site geometry and presence of barriers.

British Standard (BS) 7385 Part 1: 1990 – Evaluation and Measurement for Vibration in Buildings

Part 1 sets out the basic principles for carrying out vibration measurements and processing vibration data, with regard to evaluating the effects on buildings.

The guidance lists a number of source-related factors which need to be considered when assessing impact of vibration on buildings. These include the characteristics of the vibration, duration of the event and frequency and range of vibration intensity. In addition, building-related factors, such as the type and condition of buildings, natural frequencies and damping, building base dimensions and the influence of soil conditions, also need to be considered.

Part 1 also provides three categories for classifying the level of damages caused to buildings as a result of vibration.

- Cosmetic – The formation of hairline cracks on drywall surfaces, or the growth of existing cracks in plaster or drywall surfaces; in addition, the formation of hairline cracks in mortar joints of bricks/concrete block construction.
- Minor – The formation of large cracks or loosening and falling of plaster or drywall surfaces, or cracks through bricks/concrete blocks
- Major – Damage to structural elements of the building, cracks in support columns, loosening of joints, splaying of masonry cracks, etc.

British Standard (BS) 7385 Part 2: 1993 – Evaluation and Measurement for Vibration in Buildings

Part 2 sets out guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated.

British Standard (BS) 6472: 1992 – Guide to Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz)

BS6472 provides general guidance on vibration measurement and assessment with respect to human exposure to building vibration in the frequency range 1Hz to 80Hz.

Vibration dose values above which various degrees of adverse comment may be expected in residential buildings are provided as a guide. However, the document states that *“situations exist where motion magnitudes above those generally corresponding to minimal adverse comment level can be tolerated, particularly for temporary disturbances and infrequent events of short-term duration...Any startle factor can be reduced by warning signals, announcements and/or regularity of occurrence and a proper programme of public relations”*.

9.2.2 Assessment approach

The assessment methodology was agreed in writing with the Environmental Health Department at Flintshire County Council.

Impact assessments associated with the proposed development have been undertaken in relation to both the construction and operational phases using quantitative and qualitative methods. Noise and vibration sources associated with the construction phase and site preparation will be temporary and will include the operation of plant and machinery engaged in earthworks, and other site preparation activities.

During the operational phase the dominant noise sources will be associated with unloading of waste materials, noise from the waste compactor, traffic movements on the site and on the local road network and the use of gas a flare and engines. These impacts are considered more long-term, although the magnitude of any impact is likely to change over time in line with the uses of the landfill and adjacent quarry and completion of the different phases.

Noise impacts associated with the construction and operation of the landfill have been assessed using indicative noise levels for representative mobile plant presented in the “Updated noise database for prediction of noise on construction and open sites” released by DEFRA in July 2005. Noise predictions for the construction and operational phase of the proposed landfill have been undertaken with reference to BS5228 Part 1:1997 “Noise and vibration control on construction and open sites”.

The predicted noise levels for the construction phase have been compared to the existing ambient noise levels (LAeq,T) at nearby noise-sensitive receptors and assessed in accordance with the criteria presented in Table 9.3 below and recommendations stated within MTAN1.

In accordance with BS4142, the predicted noise levels for the operational phase of the proposed landfill have been compared to the existing background noise levels (LA90,T) at nearby noise-sensitive receptors and assessed in accordance with the criteria presented in Table 9.3 below.

The following criteria (Table 9.3) have been developed for assessing the magnitude of impact due to the development at nearby noise-sensitive receptors. This is based on the guideline levels stated in BS4142 and recommendations within MTAN1.

Table 9.3 – Criteria Adopted for Interpreting Magnitude of Impact at Sensitive Receptor Locations

Magnitude of Impact	Noise level difference between predicted noise level ($L_{Aeq,T}$) and baseline level ($L_{A90,T}$)*
No impact	Less than -5 dB
Negligible/Insignificant impact	Between -5 and equal to baseline noise levels
Minor impact	Between 0 and +5 dB
Moderate impact	Between +5 and +10 dB
Major impact	Greater than +10 dB

* Note that for the purpose of the construction impact assessment the predicted noise levels have been compared to the ambient noise levels at each receptor ($L_{Aeq,T}$)

Note that this assessment has considered the potential impacts to noise-sensitive receptors within close proximity to the site only. This is considered to represent the worst-case potential impacts associated with the proposed landfill. Residential receptors and the Hotel close to the site are assumed to have a high sensitivity, with the council offices having a medium sensitivity.

The predicted impact on local residents due to changes in the traffic flow has been predicted, with reference to the Design Manual for Road and Bridges: Volume 11 - Environmental Assessment.

The DMRB11 document states that people may find benefits or disbenefits when noise changes are as small as 1 dB(A). This is equivalent to an increase in traffic flow of 25% or a decrease in traffic flow of 20%. Note that for gradual changes in traffic flow over a longer period of time, a change in noise level of around 3 dB is generally required for a perceivable change in noise level.

9.3 Baseline Noise Conditions

9.3.1 Site Location

The site is within Alltami, Flintshire. The site is bordered by Pinfold Lane (unclassified Road) to the west, and A494 Mold Trunk road to the south. The Buckley Clay Pits and Commons SSSI can be found along the south-eastern border of the site. A dismantled railway runs in a north – south direction along the eastern boundary of the site.

The closest residential properties to the site are Parry's Cottages, which are located adjacent to the south-eastern corner of the site. A number of scattered residential properties can also be found further along Pinfold Lane to the north of the site. The closest of which are Ewloe Wood House and the Box.

In addition to these residential properties, there are also several commercial properties which may be impacted upon as a result of the proposed landfill. These include the Flintshire Council offices and depot, which are located immediately opposite the current site entrance to the quarry across Pinfold Lane and the Holiday Inn Hotel, which is located to the north-east of the site.

The site is currently used as a quarry and waste transfer station. The site was granted planning permission to operate as a waste transfer station in October 2004. As part of the planning permission a number of planning conditions relating to noise were placed at the site. These are as follows:

- Restricted operation hours to 07.00 to 18.00 Mondays to Friday, 07.00 to 16.00 on a Saturday and no workings on either a Sunday or Bank or Public Holidays, except for repair, maintenance and testing which should be carried at between 09.00 and 17.00 hours.
- The site access and access route shall be hard surfaced and maintained in a good state of repair – to minimise noise that would otherwise be generated from vehicles travelling over a broken surface.
- The noise levels arising from the development shall not exceed the following levels at any neighbouring noise sensitive properties or land uses:
 - i) In the periods 07.00-19.00 hours Mondays to Fridays and 07.00-16.00 hours on Saturdays 55 dB L_{Aeq} (1 hour) free field measurement;
 - ii) Where evening, Saturday after 16.00 hours, Sundays or Public Holiday working is authorised, 45 dB L_{Aeq} (1 hour) (free field)
- All plant and machinery operative on the site shall be maintained and silenced in accordance with the manufacturer's guidance.
- Where vibration from the site's plant and equipment is identified to be causing loss of amenity off-site, a scheme will be submitted for written approval to the Local Authority to control ground vibration.

9.3.2 Baseline Survey

In order to determine the influence of existing noise sources upon the local noise environment, representative noise measurements have been taken at four positions, which correspond to the locations of residential and commercial properties nearest to the site.

The monitoring locations were chosen to correspond with those used within the Noise Addendum in the previous Parry's Quarry Environmental Statement for the waste transfer station (carried out by the Environmental Advice Centre Ltd, now Amec Earth & Environmental). A copy of the baseline survey results from this previous survey can be found in Appendix 9.1. The monitoring locations (ML1-ML4) are shown in Figure 9.1 and are described below:

1. Grass verge adjacent to OK Dinner and Holiday Inn Hotel at A55 services
2. Grass verge adjacent to Ewloe Wood House located to the north west of the site along Pinfold Lane
3. Grass verge adjacent to the Flintshire County Council Corporate Training Centre and offices opposite the existing site entrance along Pinfold Lane

4. Adjacent to the garden areas of Parry's Cottages (Nos. 1,2,3,5 and 6) located to the south east of the site along Mold Road (A494)

All locations were agreed in writing with Flintshire County Council prior to the baseline survey being undertaken.

Noise monitoring was carried out on the 16th, 17th and 21st August 2006. Given that there is the potential for the gas flare and engines to be used during the night it was considered appropriate to undertake monitoring over a 24 hour period during a typical weekday. Note that monitoring was only undertaken during the working day at ML3, as this location represents a commercial receptor which does not operate during the night.

The sound level meter (SLM) was calibrated at the start and end of each monitoring period. No significant drift was identified.

All noise measurements were taken by mounting the SLM approximately 1.2m above the ground. Measurement positions were located at least 3.5m away from buildings or other potentially reflective surface other than the ground, providing a representative free field outdoor measurement at each receptor location.

Details relating to the calibration history of the equipment and weather conditions at the time of the survey can be seen in Appendix 9.2.

The results of the monitoring are summarised in Table 9.4 below.

Table 9.4 – Baseline Noise Monitoring Data

Monitoring Location	Start Time	Duration (mins:sec s)	L _{Aeq,T} dB	L _{A90,T} dB	L _{Amax,F} dB
ML1	08.51	20.00	58.7	56.2	69.1
	11.28	20.00	58.3	56.0	70.0
	14.43	20.00	55.9	53.5	67.1
	15.50	20.00	56.0	53.4	78.2
	20.39	20.00	56.0	52.8	65.7
	01.26	20.00	46.5	40.5	65.3
	01.46	20.00	48.9	41.6	70.8
ML2	09.15	20.00	54.7	48.0	76.2
	11.56	20.00	54.5	46.3	75.6
	15.08	20.00	56.6	52.4	74.8
	16.16	20.00	57.8	52.8	74.2
	21.07	20.00	54.3	41.8	72.5
	23.42	20.00	47.7	39.9	71.2

	00.33	20.00	49.1	38.9	71.4
ML3	07.43	20.00	69.0	61.7	85.8
	10.32	20.00	67.4	58.3	84.9
	14.11	20.00	64.4	55.2	74.9
	16.42	20.00	66.5	58.8	84.4
ML4	08.15	20.00	56.2	52.9	68.5
	10.59	20.00	55.9	52.5	65.1
	14.37	20.00	55.0	50.3	68.3
	17.11	20.00	55.5	52.1	74.1
	22.16	20.00	49.6	41.3	67.5
	00.07	20.00	45.2	37.7	66.5
	00.59	20.00	41.5	32.6	60.8

NB - Night-time measurements are shaded

The existing noise environment at the site generally comprises noise from plant and machinery associated with quarrying activities taking place at the site, noise from activities and heavy good vehicles movements taking place at the adjacent Scania site and traffic noise from the A55 and A494.

The dominant noise source throughout the noise survey at ML1 (adjacent to the Holiday Inn and OK Diner) was traffic noise from the A55. Noise from traffic within the services was also audible at this location. Noise from quarrying activities at the site was audible between 08.51 and 09.11 on the 16th August. In addition, noise from Pinfold Lane Quarry, operated by Brock Plc, was audible at this location between 14.43 and 16.10 on the 21st August. Additional noise sources at this location includes, talking from visitors and workers at the hotel and diner and bird song.

The daytime noise environment at ML2 (Ewloe Wood House) comprised continuous traffic noise from the A55 and occasional noise from passing traffic along Pinfold Lane and noise from activities and HGV movements within the adjacent Scania site. The dominant noise source at this location during the evening and night comprised traffic noise from the A55 and a low frequency hum from the Scania site. Noise from a pressure washer being used intermittently at Scania was also audible between 21.07 and 21.27. Impact noise from the Scania site was occasionally audible between 23.42 and 00.02. Noise from quarrying activities taking place at Pinfold Lane Quarry was also audible on the 21st August between 15.08 and 16.36.

The dominant noise source at ML3 (Council offices) comprised traffic noise from the A494 and occasional traffic movements along Pinfold Lane. Traffic noise from the A55 was also audible at this location during periods of low traffic flow along the A494. Noise from plant and equipment being used at the existing quarry was audible at this location during the day.

The daytime noise environment at ML4 (Parry's Cottages) was predominantly associated with constant traffic noise from the A494. A constant hum from traffic along the A55 and bird song was also audible at this location. Noise from quarrying activities was audible at this location between 14.37 and 14.57. The night-time noise environment was dominated by traffic noise from the A55 and occasional traffic along the A494.

Given that the baseline survey was carried out during the holiday period there is the potential for increased traffic noise from the A55. As a result, it was agreed with Flintshire County Council that the daytime noise levels from the previous monitoring survey (carried out on the 29th September 2004) would be utilised, along with the new data, to derive an average daytime noise level for each monitoring location for use within the assessment (see Table 9.5 below).

Table 9.5 – Average Noise Levels based on Amec's Monitoring Data

Monitoring Location	Period	L _{Aeq,T} dB	L _{A90,T} dB	L _{Amax,F} dB
ML1	Day	61	58	78
	Night	48	41	69
ML2	Day	55	51	75
	Night	48	39	71
ML3	Day	71	62	90
ML4	Day	55	51	73
	Night	44	36	65

NB - Night-time measurements are shaded

The average noise levels above indicate that the noise levels already experienced outside the Council offices are well in excess of the recommended levels stated within BS8233, assuming that the office does not have mechanical ventilation. In addition, existing noise levels adjacent to the hotel are already in excess of L_{Aeq} 55 dB, which is the WHO threshold for serious daytime annoyance.

9.4 Assessment of Potential Noise Impacts

The proposed landfill may have an impact upon the existing local noise environment during both the construction and operational phase. There is the potential for site preparation work to be undertaken simultaneously with operating activities. As a result, the combined impact of all noise sources which could be undertaken at the site time has also been assessed.

All impacts predicted within this assessment are considered to be localised and direct. However, unfavourable meteorological conditions, such as wind gradients and temperature inversions could transfer noise further away from the site making any potential impacts more widespread.

9.4.1 Construction Phase

For the purpose of this assessment the construction phase is taken as site preparation works required prior to the commencement of landfilling activities in each cell. It is anticipated that the site preparation phase will require a period of approximately 12 months in total. Although work is likely to be concentrated between March/April and September/October.

The initial site preparation works at the site will include the construction of the haul road along the southern and eastern section of the landfill and preparation of the cell 1. The preparation works of subsequent cells (3-4) and the extension of the haul road along the western boundary of the landfill is likely to be undertaken simultaneously with landfilling activities at the site.

The detailed programme of works for the site preparation had not been finalised prior to the preparation of this report. However, a number of assumptions have been made relating to the site preparation works required and the type of plant which may be utilised on site. These assumptions are based on observations on site and experience from similar sites. This has allowed the potential impact on nearby noise-sensitive receptors to be estimated. Note that it is assumed that no construction and site preparation works will be undertaken during the night.

It is anticipated that, where possible, plant and machinery already present on site will be utilised to carry out site preparation works. This will minimise the amount of additional noise sources present on site during the construction phase.

It is assumed that there will be an additional tracked excavator, dozer and dump truck present on site to assist with the redistribution of materials and levelling for the haul road. For the purpose of this assessment a worst-case scenario has been assumed with all three items of plant operational simultaneously at the closest distance to the noise-sensitive receptors.

Following this initial preparation work, the haul road will be covered with asphalt to ensure that the road can be kept clean and in good condition during the life of the landfill. The predicted calculations for road surfacing activities assume that there will be an asphalt spreader, chip spreader, road roller and tipper lorry present on site at this time.

In addition to the construction of the haul road the water from within the quarry void will need to be drained. It is assumed that at least 2 No. diesel fuelled water pumps will be utilised to drain the lagoons. It is likely that the pumps and associated storage equipment will be located within the quarry void and hence will be screened to a degree from the existing quarry faces. The site development plan indicates that the lagoon located in the southern section of the site is likely to be drained the cell preparation works for cell 2, with part of the northern lagoon being drained during the preparation works for cell 4.

It is assumed that there will be up to two additional tracked excavators, dozer, roller and dump truck present on site to assist with the cell preparation works. For the purpose of this assessment a worst-case scenario has been assumed with all five items of plant

operational simultaneously at the closest distance to the noise-sensitive receptors. Note that this work will be undertaken within the existing quarry void (approximately 25-30m below the existing ground level) and hence noise will be attenuated by the quarry face. However, there is the potential for some noise to reverberate from the opposing quarry faces, which could potentially reflect sound to towards the noise-sensitive receptors.

For the purpose of this report the distance between the source and receiver has been taken as the closest distance between the receptor and the location of the construction activity. Given that the construction plant is likely to move around the site, depending on the area under construction at that time, this represents the worst-case scenario. Note that the predicted noise levels assume that these activities will take place over the majority of the working day and hence a time correction of -1.2dB has been applied to the noise predictions (in accordance with BS5228: 1997).

In accordance with BS5228: 1997 a -5dB barrier correction has been applied where the noise source is along the line of sight with the noise-sensitive receptors or partially screened by either topography or barriers. Where the noise source is considered likely to be completely screened by these features a -10 dB barrier correction has been applied. Note that the BS5228 barrier corrections represent a straightforward approach and high topographical features or specially designed and positioned noise barriers could provide greater attenuation. Where noise sources are not screened by topography or by man made features, attenuation from ground cover has been taken into account using the formula presented within CRTN.

BS4142 states that a +5 dB correction factor should be applied when the noise source contains distinguishing features, distinct impulses or is irregular enough to attract attention. Given the potential for single frequency reversing alarms to be used on the dump truck and tracked excavator during the site preparation works (haul road and cell preparation works) a tonal correction has been added to the predicted level at the receptor.

The predicted noise levels at the closest noise-sensitive receptors to the site have been calculated and are presented in Tables 9.6 and 9.7 below.

Construction of the Haul Road

The results indicate that the construction of the southern and eastern section of the haul road is likely to have a negligible impact on workers located in the Council offices. However, residents living in Ewloe Wood House may potentially experience a minor adverse impact, with visitors to the hotel potentially experiencing a moderate adverse impact as a result of the construction of the haul road. Furthermore, residents living at Parry's Cottages could potentially experience a major adverse impact as a result of these activities.

The construction of the western section of the haul road has the potential to result in a minor adverse impact at Ewloe Wood House. All other receptors are unlikely to be affected by the construction of the western section of the haul road.

Note that the potential impact to residents living at the Box, located to the north of the site, is considered to be similar to that likely to be experienced at Ewloe Wood House. Although the Box is slightly closer to the proposed landfill than Ewloe Wood House, the baseline noise levels are likely to be higher due to the property's close proximity to the A55.

Given that the construction of the haul road is not likely to exceed 8 weeks at the closest point to the receptor, it is considered appropriate to also compare the results to the temporary threshold level of 67 dB $L_{Aeq,1hr}$ for site preparation works as recommended within MTAN1. The predicted noise levels at the Holiday Inn Hotel and Council Office are predicted to be slightly in excess of this threshold level during the site preparation works for the southern and eastern section of the haul road. However, the predicted noise levels at both residential receptor locations, for both phases of the construction of the haul road, are predicted to be below this threshold level.

Cell Preparation Works

The results indicate that the preparation of Cell 1 is unlikely to have an adverse impact on any nearby noise-sensitive receptor, with all predicted noise levels below the existing ambient noise level at each receptor location. In addition, the predicted noise levels are also below the threshold level of 67 dB $L_{Aeq,1hr}$ for site preparation works as recommended within MTAN1.

The preparation works for Cells 2-4 are considered unlikely to have an adverse impact on visitors at the Holiday Inn Hotel, residents living at Ewloe Wood House or workers located at the Council Offices. Note that the noise levels experienced at Ewloe Wood House could be further reduced by the closed timber board fencing proposed along the northern boundary of the site.

Residents living within in Parry's Cottages however could potentially experience a minor adverse impact during the preparation works within Cells 2 and Cell 3. Note that the predicted noise level at each receptor is again below the 67 dB $L_{Aeq,1hr}$ recommended within MTAN1.

Drainage of Lagoons

The predicted results indicate that noise from the drainage of the lagoons, both in the south and northern sections of the site are likely to have no impact on noise-sensitive receptors within the vicinity of the site.

It should be noted that predictions assume a worst-case with respect to construction noise i.e. that construction activities are occurring continuously throughout the day at the closest point to the receptors. In reality, construction activities taking place within the immediate vicinity of each property will be short-term in comparison to the duration of the entire site preparation and construction phase and hence disturbance caused by construction activities will be temporary.

Table 9.6 - Predicted noise level ($L_{Aeq,1hr}$, dB) from construction activities

Receptor	Haul Road Construction – southern and eastern section		Haul Road Construction – western section		Cell Preparation		Drainage of Lagoons	
	Site preparation	Road Surfacing	Site preparation	Road Surfacing	Cell 1	Cells 2-4*	Southern	Northern
Holiday Inn Hotel (ML1)	67.4	62.9	53.7	44.1	59.7	56.8	34.0	34.2
Ewloe Wood House (ML2)	58.4	53.8	57.6	48.1	51.4	49.1	29.9	34.4
Council Offices (ML3)	68.0	63.5	58.0	48.5	46.9	56.1	38.4	33.4
Parry's Cottages (ML4)	65.5	61.0	51.6	42.1	51.9	58.1	41.1	33.1

* Taken as closest cell to receptor

Table 9.7 - Noise level difference between the predicted noise level ($L_{Aeq,1hr}$ dBA) due to construction activities and existing daytime ambient noise level ($L_{Aeq,T}$ dBA) at noise-sensitive receptors

Receptor	Average ambient noise level ($L_{Aeq,t}$)	Haul Road Construction – southern and eastern		Haul Road Construction – western		Cell Preparation		Drainage of Lagoons	
		Site preparation	Road Surfacing	Site preparation	Road Surfacing	Cell 1	Cells 2-4*	South ern	North ern
Holiday Inn Hotel (ML1)	61	+6.4	+1.9	-7.3	-16.9	-1.3	-4.2	-27.0	-26.8
Ewloe Wood House (ML2)	55	+3.4	-1.2	+2.6	-6.9	-3.6	-5.9	-25.1	-20.6
Council Offices (ML3)	71	-3.0	-7.5	-13.0	-22.5	-24.1	-14.9	-32.6	-37.6
Parry's Cottages (ML4)	55	+10.5	+6.0	-3.4	-12.9	-3.1	+3.1	-13.9	-21.9

9.4.2 Operational Phase

The operation of the proposed landfill will include the following potential noise sources:

- lorry movements along the haulage road and unloading events;
- redistribution and compaction of waste;
- operation of the emergency gas flare and engines; and
- traffic on the local road network;

Note that these noise sources will be in addition to the noise emissions already experienced from quarrying activities, which are due to continue on the site.

a) Lorry movements and unloading events

Predicted noise levels at the closest residential properties to the site have been calculated with reference to the methodology stated within BS5228: 1997. This provides a pragmatic approach for predicting the noise level ($L_{Aeq,T}$) at a receptor due to noise from mobile plant using a regular well defined route, such as a haulage route. The procedure takes into account the distance between the receiver and the centre of the haul road, the number of vehicles per hour, average speed and angle of view. Traffic flow data provided by Veryards Opus Ltd indicates that there will be 290 additional vehicles a day at the site entrance as a result of the proposed landfill. This equate to an average of approximately 29 movements per hour, based on an average 10 hour working day.

Table 9.8 - Predicted noise level ($L_{Aeq,1hr}$ dB) from lorry movements and unloading events

Receptor	Unloading events*	Movements along the haul road
Holiday Inn Hotel (ML1)	54.8	54.2
Ewloe Wood House (ML2)	33.9	35.8
Council Offices (ML3)	45.9	47.8
Parry's Cottages (ML4)	53.8	55.1

* Taken at closest cell to receptor

Table 9.9 - Noise level difference between the predicted noise level ($L_{Aeq,1hr}$ dBA) due to operational activities and existing daytime background noise level ($L_{A90,T}$ dBA) at noise-sensitive receptors

Receptor	Average background noise level ($L_{A90,t}$)	Unloading events*	Movements along the haul road
Holiday Inn Hotel (ML1)	58.0	-3.2	-3.8
Ewloe Wood House (ML2)	51.0	-17.1	-15.2
Council Offices (ML3)	62.0	-16.1	-14.2
Parry's Cottages (ML4)	51.0	+2.8	+4.1

The results indicate that noise from unloading events and vehicle movements along the internal haul road are unlikely to have an impact on Ewloe Wood House (ML2), the adjacent Council Offices (ML3) or the Holiday Inn Hotel (ML1). However, there is the potential for noise from these activities to result in a minor adverse impact at Parry's Cottages (ML2).

Note that with the exception of a very marginal exceedence at Parry's Cottages for vehicle movements along the haul road, all predicted noise levels are within the $L_{Aeq,t}$ 55 dB threshold recommended by MTAN1.

b) Redistribution and compaction of waste

During the operation of the landfill it is assumed that there will a waste compactor and dozer active on-site. The impact due to the operation of these items of plant on site will vary over the life of the landfill, depending on which cell is being filled at that time and the level of the fill relative to the surrounding ground level.

The site development plan indicates that the cells will be filled in a clockwise fashion with Cell 1-4 initially being filled to grade i.e. level with the surrounding land elevation (sequences 1-4). This will be followed by a new sequence, with cells 4, 1, 2, 3 being filled to their completion elevation, above grade (sequence 5-8).

Based on a lifetime of 15 years for the landfill, it is likely that each sequence will be undertaken over a period of approximately 20 months. Thus the maximum period that landfilling will take place in each cell is approximately 40 months.

For the purpose of this assessment, a worst-case assumption has been made i.e. that the two items of plant will be in operation simultaneously in the closest cell and at the closest position to the receptor. Predicted noise levels have been calculated for both sequences 1-4 and sequences 5-8.

It is assumed that reversing beepers will be used on the dozer and hence a tonal correction of +5dB has been applied to the predicted noise levels.

During sequences 1-4 operations will be active below surrounding ground level for a large proportion of the time. The sides of the landfill will provide natural screening from noise, significantly reducing the risk of impact experienced at noise-sensitive receptor locations. As a result, with the exception of Ewloe Wood House, which will benefit from noise attenuation from the screening fence, a barrier correction of -5dB (for a partial screen) has been applied to the calculations for sequences 1-4. Note that the attenuation is likely to be significantly greater than this initially, with activities being undertaken in excess of 20m below the existing ground level.

Representative noise levels for a waste compactor and dozer have been taken from the waste disposal sites section of the DEFRA database. The calculations assume that the plant will be in operation for 75% of the reference period (1 hour during the day).

Table 9.10 - Predicted noise level ($L_{Aeq,1hr}$ dB) from redistribution and compaction of waste

Receptor	Cell Sequence 1-4*	Cell Sequence 5-8*
Holiday Inn Hotel (ML1)	58.5	61.8
Ewloe Wood House (ML2)	45.2	50.2
Council Offices (ML3)	54.8	59.8
Parry's Cottages (ML4)	56.9	58.1

* Taken as closest cell to receptor

Table 9.11 - Noise level difference between the predicted noise level ($L_{Aeq,1hr}$ dBA) due to operational activities and existing daytime background noise level ($L_{Aeq,T}$ dBA) at noise-sensitive receptors

Receptor	Average background noise level ($L_{A90,t}$)	Cell Sequence 1-4*	Cell Sequence 5-8*
Holiday Inn Hotel (ML1)	58.0	+0.5	+3.8
Ewloe Wood House (ML2)	51.0	-5.8	-0.8
Council Offices (ML3)	62.0	-7.2	-2.2
Parry's Cottages (ML4)	51.0	+5.9	+7.1

The results above indicate that the redistribution and compaction of waste during sequences 1-4 has the potential to result in a minor adverse impact for visitors at the hotel during the day and a moderate adverse impact on residents living at Parry's Cottages. Residents and workers at Ewloe Wood House and the Council Offices are unlikely to experience an impact as a result of these activities.

The redistribution and compaction of waste during sequences 5-8 when activities will be undertaken above grade is again likely to result in a minor adverse impact at the Holiday Inn and moderate impact at Parry's Cottages. Ewloe Wood House and the Council Offices are likely to experience a negligible impact as a result of these activities.

In accordance with BS4142, residents living at Parry's Cottages may have a marginal cause for complaint as a result of waste redistribution and compaction at the site.

The results above indicate that the predicted noise levels as a result of these activities slightly exceed the $L_{Aeq,t} 55$ dB threshold level recommended by MTAN1 for operational noise at the Holiday Inn Hotel (sequences 1-4 and 5-8), Council Offices (sequences 5-8) and Parry's Cottages (sequences 1-4 and 5-8). Note that the calculations above are based on a number of worst-case assumptions. In reality, the noise levels experienced from these activities is considered likely to be less than that predicted, with activities taking place at the closest point to the receptor for a very short duration in comparison to the life of the landfill.

c) Gas flare and engines

The Project Description (Section 2.0) indicates that a maximum of 3 No. landfill gas utilisation engines and a flare will be used at the proposed landfill. The plant will be situated in the north-eastern corner of the site.

Typically landfill gas collection will commence when approximately 10m depth of waste has been deposited. Initially the quality and quantity will not be sufficient to support efficient combustion as fuel supply for gas driven engines. As a result, the gas collected during this initial stage will be flared. Note that the operation of the gas engines will take place once a significant depth of waste has been deposited.

The main noise generating mechanisms of a gas flare are:

- turbulent air flow caused by the high-velocity, high temperature gas flow. Noise caused by this turbulent airflow is usually low frequency (below 50Hz). Noise increases with velocity and temperature. The Environment Agency's Internal Guidance for the Regulation of Noise from Waste Management Facilities (2002) states that noise generation from flare is generally not regarded as a major concern at velocities below 30m/s;
- combustion produced low frequency noise, below 350Hz;
- noise from injection of smoke suppressants, such as high pressure steam, produced high-frequency noise.

In addition, under rare conditions the low frequency vibration derived from the turbulence within the enclosed flare can induce resonance within nearby structures, such as buildings and vehicles. The effect of vibration is attenuated with distance. Given that the nearest residential properties are located over 200m from the proposed location for the gas engines/flare, it is considered unlikely that vibration will result in a significant adverse impact to residents.

For the purpose of this assessment it is assumed that there will be one gas flare and three engines present on site. This represents the worst-case scenario. Noise levels for a typical gas flare (3000Nm³/f) and gas engine have been provided by the

manufacturer. These noise levels have been utilised in order to estimate the potential noise levels at nearby noise-sensitive receptors. Given that the gas flare and engines are likely to be continuously operational the potential impacts have been assessed for both the day and night (see Tables 9.12-9.13 below).

Table 9.12 - Predicted noise level ($L_{Aeq,1hr}$ dB) from the operation of the gas flare and engines

Receptor	Gas flare	Gas engines
Holiday Inn Hotel (ML1)	37.1	37.9
Ewloe Wood House (ML2)	36.3	37.1
Council Offices (ML3)	33.3	34.1
Parry's Cottages (ML4)	29.5	30.3

Table 9.13 - Noise level difference between the predicted noise level ($L_{Aeq,1hr}$ dBA) due to the operation of the gas flare and engines and existing background noise level ($L_{A90,T}$ dBA) at noise-sensitive receptors

Receptor	Average background noise level ($L_{A90,t}$)		Gas flare		Gas engines	
	Day	Night	Day	Night	Day	Night
Holiday Inn Hotel (ML1)	58.0	41.0	-20.9	-3.9	-20.1	-3.1
Ewloe Wood House (ML2)	51.0	39.0	-14.7	-2.7	-13.9	-1.9
Council Offices (ML3)	62.0	N/A	-28.7	N/A	-27.9	N/A
Parry's Cottages (ML4)	51.0	36.0	-21.5	-6.5	-20.7	-5.7

The results indicate that the operation of either the gas flare or the gas engines during the day is very unlikely to result in disturbance to nearby residents and workers, with all predicted levels below the existing background levels. In addition, all noise levels are predicted to be below the $L_{Aeq,t}$ 55dB threshold level recommended in MTAN1. In accordance with BS4142, complaints are considered unlikely as a result of the operation of the gas flare/engines at the site.

The operation of the gas engines during the night is considered unlikely to result in disturbance, as predicted noise levels at all 4 No. monitoring locations are below the existing background levels. The use of the gas flare during the night is also unlikely to result in an impact at Parrys Cottages (ML4), with residents at Ewloe Wood House (ML2) and the Holiday Inn Hotel likely to experience a negligible impact. All the predicted night-time noise levels for the operation of the gas flare are below the threshold level of $L_{Aeq,t}$ 42 dB as recommended within MTAN1 and below the WHO guideline level for night-time sleep disturbance $L_{Aeq,8hrs}$ 45dB.

d) Traffic

Traffic flows (18hour) for the site entrance, Pinfold Lane and A494 have been provided by Veryards Opus Ltd for 2006, 2008 and 2023. In order to assess the potential impact of the proposed landfill on the local road network, the traffic flows for the Do-Minimum (without development) and Do-Something (with development) have been compared in 2008 (opening year) and 2023.

A comparison between the Do-Minimum and Do-Something traffic flows indicates that there is likely to be at most a 0.5% increase in traffic flows along the A494 as a result of the scheme. Furthermore, traffic from the proposed landfill is likely to result in an increase in traffic along Pinfold Lane (North - before the site entrance) of between 9.1 (2023) and 11.6% (2008), with no change north of the site entrance and only a 1.8-2.3% increase in flow along Pinfold Lane south of the site. DMRB11 states that an increase in traffic flow of 25% represents an increase in noise level of 1dB. This has been verified through discussions with the Highways Agency. Generally a 3dB change in traffic noise level, under free flowing conditions, is the minimum change to result in a perceivable impact. As a result, it is extremely unlikely that increases in traffic along Pinfold Lane or the A494 will result in an audible increase in traffic noise in the area. Note that traffic flows within the site has been assessed previously in Section 9.4.2 a).

In addition to the increase in traffic flows, there is the potential for an increase in traffic noise as a result of a higher proportion of heavy goods vehicles (HGVs) on the local road network. The traffic data provided by Veryards Opus Ltd indicates that percentage of HGVs on the A494 are likely to only increase by a maximum of 0.39% in 2023 (eastbound). This is not considered significant and hence is extremely unlikely to result in an audible increase in noise.

The percentage of HGVs is estimated to increase by 3.7% in 2008 along Pinfold Lane south of the site. Using the methodology stated within CRTN (Chart 4) the impact of this increase in HGVs on traffic noise has been estimated. The calculations assume an average speed of 40mph (64 km/hr) and assume that the average speed will remain unchanged between 2006 and 2016. The results indicate that the predicted increase in the percentage of HGVs is likely to result in a noise increase of up to approximately 0.4 dB. As a result, it is considered unlikely that any change in the percentage of HGVs along this section of Pinfold Lane as a result of the development will be perceptible in terms of noise.

The greatest percentage change in HGVs as a result of the proposed landfill is predicted to be along Pinfold Lane north (before the site entrance). The percentage change in

HGVs is estimated to increase by 7.1% in the opening year (2008). This represents a change in noise level of approximately 0.7 dB. Such a marginal change in noise level is unlikely to be perceivable and hence is not considered significant.

9.4.3 Combined Noise Levels

As mentioned previously, there is the potential for both site preparation works and operational noise from landfilling activities to occur at the same time on site. Consequently, the noise impact of the development may be greater than the individual impacts described above for each of the noise sources.

The predictive assessment above takes into account a number of worst-case assumptions. It is not considered appropriate to merely combine these noise levels to provide an overall potential noise level from the site as this is likely greatly overestimate the impact on nearby noise-sensitive receptors.

Based on the individual noise levels predicted for each activity and the proximity of each receptor to these activities and the receptors sensitivity, it is considered unlikely that workers in the Council Offices will be impacted upon by site preparation and operational activities taking place at the proposed landfill. There is the potential for residents living at Ewloe Wood House to experience a minor-moderate adverse impact when the western section of the haul road is construction simultaneously to operational activities. However, the combined impact of other site preparation activities and operational activities is at worst, likely to result in a minor adverse impact at this location.

It is considered unlikely that visitors to the Holiday Inn Hotel will experience an adverse impact as a result of the proposed landfill for the majority of its lifetime. There is the potential for visitors to experience a minor adverse impact during operational activities within Cell 1. However, this is only likely when works are being undertaken above grade during Sequence 6.

The predictive assessment has demonstrated that there is the potential for a minor adverse impact to be experienced at Parry's Cottages due to individual site preparation and operational activities. The combination of these works within close proximity to Parry's Cottages could result in a temporary moderate adverse impact.

9.4.4 Cumulative Assessment

It is understood that there is a proposal to improve the A55 junction adjacent to the Parry's Quarry site. There are currently two possible routes for the improved junction. One of which involves the widening of Pinfold Lane adjacent to the site. It is recognised that due to the close proximity of this route, it is likely to have impact on the noise environment within and around the proposed landfill site.

9.4.5 Vibration

The prediction of vibration levels during the site preparation and operational activities on the landfill have not been undertaken, due to the a number of varying factors which need to be considered including the soil type and properties between the source and receiver and building type.

Given the type of activities proposed and type of equipment likely to be utilised on the site, it is considered unlikely that vibration will be an issue during the site preparation and operation of the landfill. However, in the event that vibration is found to be a nuisance to residents, and complaints arise, it is recommended that noise and vibration surveys are undertaken to ascertain whether the vibration is ground-borne or airborne and mitigation measures should be adopted if necessary.

9.4.6 Potential Impact on Wildlife

In addition to the potential impacts on nearby residents and workers, there is the potential for disturbance to the adjacent SSSI during both the construction phase and operation phase of the proposed landfill. Noise from construction works may cause sensitive birds and mammals to deviate from their normal, preferred behaviour. However, it is difficult to make generalisations about the likely effects of disturbance because a wide range of factors are involved and different species react differently.

Information regarding potential effects of noise on wildlife is very limited, and in the case of birds most studies relate to the effects of road traffic noise. It is likely that the level of impact will depend on the type and timing of disturbance and the proximity of the sources to the sensitive populations. It is thought that some birds adjust to long-term continuous levels or movement and that unpredictable or erratic noise events are more likely to cause disturbance.

Other factors that could influence responses of birds to noise could be;

- the proximity of alternative roosting/resting/feeding areas;
- the time of year (vulnerability may increase during particular periods such as the breeding season, or the autumn/winter migration);
- during hard weather conditions when birds require more food than normal to balance energy budgets.

It is considered unlikely that wildlife will be disturbed by general construction or operational activities taking place on the landfill site, however tonal or random impact noise, such as high frequency noise from reversing beepers, may have a short-term disturbance effect on birds in the SSSI. However, the existing baseline noise environment at the boundary of the SSSI is already characterised by random impact noise and vehicle reversing noise generated from the existing quarry, Pinfold Lane Quarry and nearby Scania site. Set against this baseline, it is considered very unlikely that noise from the proposed landfill will have any further significant effect on birds.

9.5 Mitigation Measures for Noise

9.5.1 Construction Phase

It is recommended that a noise management plan is submitted to Flintshire County Council prior to the commencement of the construction phase. The noise management plan should utilise the guidance in BS5228, which describes the measures which will be taken in order to arrange and minimise as far as reasonably practical the noise impacts

of construction. It is recommended that consultation with Flintshire County Council is undertaken during the preparation of the noise management plan.

The noise management plan should contain the proposed hours of operation during the construction phase, details of any proposed noise mitigation including any scheduling of noisy activities to certain times of the day etc. and any procedures for improving community relations and dealing with complaints.

9.5.2 Operational Phase

a) *Activities within the landfill*

Various noise mitigation measures will be undertaken at the site to minimise noise emissions from the operation of the landfill. Where possible these have been taken into account in the predictive assessment. These measures include:

- a hard metalised surfaced internal haul road, which will be maintained to allow efficient use and minimise vehicle noise;
- restriction of the vehicle speed along the haul road to avoid body slap from empty lorries;
- restriction on the operating hours of the site;
- a landfill maintenance programme, with particular attention being given to maintaining improving the noise muffling system on landfill construction and waste/cover soil placement equipment;
- a closed board fence along the northern boundary of the site, which should attenuate noise propagation to Ewloe Wood House and the Box.

In addition to the above mitigation measures it is also recommended that the landfill operator should use the quietest available plant to carry out the task effectively. The operator should also emphasise the need to minimise noise through training of site personal and ensure that there is a comprehensive complaint procedure set up to deal with any complaints received.

The predictive assessment has assumed that single frequency reversing alarms will be utilised on the site during both the site preparation and operational phase of the proposed landfill. Given that these alarms commonly give rise to complaints a tonal correction of +5dB has been applied to the calculations, where necessary. Although these alarms are required for health and safety reasons, there are a number of alternative options available such as directional and adjustable systems, which can help minimise the noise impact at nearby noise-sensitive receptors. It is recommended that alternative reversing alarm systems are considered in order to minimise noise disturbance to nearby residents.

It is also recommended that an acoustic screen is positioned along the southern boundary of the site to minimise noise disturbance to residents living at Parry's Cottages. The detailed design and positioning of this barrier is beyond the scope of this assessment and should be undertaken as part of a planning condition.

b) Gas flare and engines

The noise assessment has identified that, given the noise generation characteristics of typical gas flare and gas engine installations, specific mitigation to prevent noise nuisance/disturbance at noise-sensitive receptors is not necessary.

c) Traffic

The impact of increased traffic movements is considered negligible, with all increased likely to be imperceptible to local residents. As a result, no noise mitigation is considered necessary.

9.6 Residual Impacts

9.6.1 Construction Phase

There is the potential for noise disturbance during the initial site preparation works to result in disturbance to nearby residents. This is mainly due to the construction of the internal haulage route.

The development and use of a noise management plan during the construction phase of the works should minimise noise disturbance to nearby residents as far as reasonably practicable. As a result, it is considered unlikely that residents living at Ewloe Wood House or workers at the Council Offices will be impacted upon by the initial site preparation works. Visitors to the Holiday Inn Hotel may at worst experience a minor adverse impact, with residents at Parry's Cottages potentially experiencing a temporary minor-moderate adverse impact. Note that if the acoustic screen is constructed along the southern boundary of the site prior to any site preparation works taking place, the impact to residents at Parry's Cottages will be further reduced and is likely to be negligible to minor.

9.6.2 Operational Phase

The operation of the site in accordance with best practice and the positioning of an acoustic screen along the southern boundary of the site should ensure that residents and workers around the site at worst, experience a temporary minor adverse impact due to operational activities on the site during the day. Assuming that the local community and Council are kept informed of the stage of the landfilling operations and the likely timing and duration of noisy events at the site, it is considered unlikely that complaints will be received.

9.7 Conclusions from Noise and Vibration Assessment

The tables presented in Appendix 9.3 summarise the impacts relating to noise generated by the construction and operational phases of the development and the likely residual impacts resulting from proposed mitigation measures.

Noise monitoring has been undertaken at 4 No. noise-sensitive receptors located within the vicinity of the site in order to characterise both the daytime and night-time noise

environment. In general, the noise environment within the vicinity of the site is dominated by road traffic noise, associated with the A494, A55 and to a lesser extent Pinfold Lane.

The detailed programme of works for site preparation and construction had not been finalised prior to the preparation of the report. As such, a number of assumptions have been made with respect to the likely plant involved in site preparation works. The assessment has demonstrated through predictive calculations that the construction of the haulage route within the site has the potential to result in an adverse impact on nearby residents, particularly Parry's Cottages. In order to minimise the magnitude of impact the contractor will submit a noise and vibration management plan prior to any construction work on site. This will be prepared in consultation with Flintshire County Council.

Potential noise sources as a result of the proposed landfill include, noise from lorry movements along the haulage road and unloading events, the redistribution and compaction of waste, the operation of the gas engines and flare and traffic on the local road network. Note that these noise sources will be in addition to the noise emissions already experienced from quarrying activities, which are due to continue on the site.

Predictive calculations have been undertaken to assess the potential impact on nearby noise-sensitive receptors from operational noise. These calculations are based on a number of worst-case assumptions. The results have been assessed in accordance with BS4142 and MTAN1.

The results indicate that there is the potential for a minor adverse impact at Parry's Cottages as a result of lorry movements along the haulage route and unloading events. All other receptors are unlikely to be impacted upon by such activities. The traffic flow data provided by Veryards Opus Ltd has indicated that the percentage change in overall flow and percentage of HGVs is not sufficient to result in an audible increase in noise level and hence is not considered significant.

There is the potential for a moderate adverse impact at Parry's Cottages and a minor adverse impact at the Holiday Inn during the day when redistribution and compaction of wastes is undertaken within the closest cell to the receptor.

The use of the gas flare and engines during the day and night is considered unlikely to result in disturbance to nearby noise-sensitive receptors.

As mentioned previously, there is the potential for both site preparation works and operational noise from landfilling activities to occur at the same time on site. Consequently, the noise impact of the development may be greater than the individual impacts described above for each of the noise sources. It is considered unlikely that workers in the Council Offices will be impacted upon by the proposed landfill. Residents at Ewloe Wood House may experience a temporary moderate adverse impact during the construction of the western haul road. However, for the majority of the lifetime of the landfill it is unlikely that these residents will experience anything more than a minor adverse impact and only when works are occurring within the northern section of the site. There is the potential for at worst, a minor adverse impact at the Holiday Inn Hotel. However, again this is only likely when works are being carried out close to the Hotel. In addition, there is the potential for a minor adverse impact for residents living at Parry's

Cottages. This is likely to increase to a moderate adverse impact if there is a combination of activities taking place within close proximity to this location.

A number of mitigation measures are recommended within Section 9.5 for both the construction and operational phase of the proposed landfill. These include the preparation of a noise management plan for the construction phase, the operation of the site in accordance with best practice, set up of good community liaison and the construction of an acoustic screen along the southern boundary of the site. Assuming that these mitigation measures are adopted, construction noise is considered unlikely to have an impact on residents living at Ewloe Wood House or workers at the Council Offices. Visitors to the Holiday Inn Hotel may at worst experience a minor adverse impact, with residents at Parry's Cottages potentially experiencing a temporary minor-moderate adverse impact, although this may be further reduced if the acoustic screen is constructed prior to any site preparation works taking place.

The operation of the site in accordance with best practice and the positioning of an acoustic screen along the southern boundary of the site should ensure that residents and workers around the site only experience a temporary minor adverse impact due to operational activities on the site during the day. Assuming that the local community and Council are kept informed of the stage of the landfilling operations and the likely timing and duration of noisy events at the site, it is considered unlikely that complaints will be received.

Given the type of activities proposed and type of equipment likely to be utilised on the site, it is considered unlikely that vibration will be an issue during the site preparation and operation of the landfill. However, in the event that vibration is found to be a nuisance to residents, and complaints arise, it is recommended that noise and vibration surveys are undertaken to ascertain whether the vibration is ground-borne or airborne and mitigation measures should be adopted if necessary.

10.0 AIR QUALITY

10.1 Introduction

The assessment considers the potential impact of the proposed landfill site upon air quality during both the construction, operational and post closure phases.

Baseline air quality has been determined through site reconnaissance and data review which has identified existing sources of emissions to the atmosphere within the local area surrounding the proposed landfill site. Information has been obtained from Flintshire County Council (FCC) including their Air Quality Review and Assessment documents and air quality monitoring data.

The potential impacts have been assessed using both quantitative and qualitative methods. Note that no quantitative assessment has been undertaken to consider the generation of landfill gas and emissions from the gas flare and engines as part of the ES. A qualitative assessment would be undertaken as part of the IPPC application using a model such as GasSim.

Sensitive receptors that could potentially be affected by atmospheric emissions and deterioration in air quality as a result of the proposed landfill site have been identified. The impacts of the proposed landfill site on these sensitive receptors are evaluated using quantitative methodologies wherever possible. Potential impacts upon sensitive habitats and species are included in the assessment, however for more detailed assessment of the potential impacts on ecological receptors reference should be made to the Ecological Assessment (Section 11).

10.2 Air Quality Assessment Methodology

10.2.1 Guidance and Legislation

The air quality assessment has been undertaken with reference to the legislation and guidance documents.

Environment Act 1995

Part IV of the Environment Act 1995 introduces a framework for ensuring that a number of objectives in reducing and controlling key air pollutants are met. This includes a National Air Quality Strategy first published by the Secretary of State in 1997 and then revised in 2000 with an addendum published in February 2003.

National Air Quality Objectives have been established and included in the National Air Quality Strategy based upon the recommendations of work carried out by the Expert Panel on Air Quality (EPAQS) and taking into account the requirements of the EU Air Quality Daughter Directive. Objectives have been established for both the protection of both human health and vegetation. The objectives set for the protection of human health are summarised in Table 10.1, and with the exception of ozone, are prescribed in the Air

Quality (Wales) Regulations 2000 and (Amendment) (Wales) Regulations 2002 as air quality objectives for the purposes of Local Air Quality Management LAQM.

Local Authorities are required to carry out periodic reviews and assessments of air quality in their areas. Areas identified where the objectives may be exceeded should be designated as Air Quality Management Areas (AQMA).

Table 10.1- Air Quality Objectives for Local Air Quality Management (DEFRA, 2003)

Pollutant	Objectives Concentration	Measured as	Date to be achieved by
Benzene	16.25µg/m ³ (5ppb)	Running annual mean	31 December 2003
	5 µg/m ³ (1.5 ppb)	Annual mean	31 December 2010
1,3-butadiene	2.25µg/m ³ (1ppb)	Running annual mean	31 December 2003
Carbon monoxide	10mg/m ³ (8.6ppm)	Running 8 hour mean	31 December 2003
Lead	0.5µg/m ³	Annual average	31 December 2004
	0.25µg/m ³	Annual average	31 December 2008
Nitrogen dioxide*	200µg/m ³ (105ppb) not to be exceeded more than 18 times a year	Hourly average	31 December 2005
	40µg/m ³	Annual mean	31 December 2005
Particles (PM₁₀)	50µg/m ³ not to be exceeded more than 35 times a year	24 hour mean	31 December 2004
	40µg/m ³	Annual mean	31 December 2004
	50 µg/m ³ not to be exceeded more than 7 times a year	24 hour mean	31 December 2010
	20 µg/m ³	Annual mean	31 December 2010
Sulphur dioxide	350µg/m ³ (132ppb) not to be exceeded more than 24 times a year	1 hour mean	31 December 2004
	125µg/m ³ (47ppb) not to be exceeded more than 3 times a year	24 hour mean	31 December 2004
	266µg/m ³ (100ppb) not to be exceeded more than 35 times a year	15 minute mean	31 December 2005

ODPM. (2005) MPS 2: *Controlling and Mitigating the Environmental Effects of Mineral Extraction in England – Annex 1: Dust*

The document details the reduction and control of dust from mineral workings and associated operations and outlines good practice for dust assessment.

Environment Agency Guidance Documents

A series of technical guidance notes have been produced in relation to the management and monitoring of landfill gas and the gas flares and engines. The documents provide information regarding the monitoring and management requirements in relation to landfill gas, flares and engines for landfill sites. The following documents have been referenced:

- TGN03 – Guidance on the management of landfill gas (2004)
- TGN04 – Guidance on monitoring trace components in landfill gas (2004)
- TGN05 – Guidance for monitoring enclosed landfill gas flares (2004)
- TGN06 – Guidance on gas treatment technologies for landfill gas engines (2004)
- TGN07 - Guidance on monitoring landfill gas surface emissions (2004)
- TGN08 – Guidance for monitoring landfill gas engine emissions (2004)
- Guidance on landfill gas flaring (2002)

In addition, an Environment Agency document has been produced regarding the monitoring of particulate matter in ambient air around waste facilities (M17- 2004). The document provides background information regarding particulate matter generation and sources within waste facilities and presents methodologies for particulate monitoring.

Environment Agency. (2002). IPPC Horizontal Guidance for Odour H4 Part 1 – *Regulation and Permitting and Part 2- Assessment and Control*

The documents provide guidance regarding the regulation and control of odour.

Highways Agency. (2003). *Design Manual for Roads and Bridges: Volume 11 – Environmental Assessment (DMRB11). Section 3 Part 1.*

The Design Manual for Roads and Bridges: Volume 11 (DMRB11) provides a screening methodology for assessing the impacts of additional vehicle movements on the local road network. The DMRB 11 methodology is strictly applicable to new road scheme, the procedures are widely adopted for assessment of general schemes to consider the impact of vehicle related pollutant concentrations.

Kukadia, Upton and Hall (2003). *Control of Dust from Construction and Demolition Activities.* BRE Press

The document provides guidance regarding the control of dust generated from construction and demolition activities including suggested methods for the reduction of dust nuisance from sites.

London working group on Air Pollution Planning and the Environment (APPLE). (2005): *Draft London Code of Practice, Part 1- The Control of Dust from Construction.*

A wide range of dust control measures for various construction activities are presented along with suggested monitoring protocols. The code has been developed for London, but provides useful generic information and case studies.

NSCA. (2004). *Development Control: Planning for Air Quality*. NSCA.

The document provides guidance regarding the assessment of air quality issues within planning applications including a summary of relevant legislation, the content of assessments and the assessment of significance.

Assessment Approach

The approach to assessment was agreed in writing and during a meeting held with the Environmental Health Department at Flintshire County Council (22.8.06 – R Johnston, A Fuller, E Hocking and G Bishop). Note that FCC require that baseline particulate monitoring is undertaken. However, as there was insufficient time available to undertake the monitoring for inclusion within the ES, it has been agreed that monitoring will be undertaken following submission of the ES and will be included as a condition to the planning consent. Correspondence relating to the particulate monitoring exchanged between AMEC E&E UK Ltd and FCC is provided as Appendix 10.1.

Impact assessments associated with the proposed facility have been undertaken in relation to both the construction and operational phases using quantitative and qualitative methods. The potential impact during the operational phase, resulting from development related traffic have been assessed using the screening methodology described within DMRB 11 (Volume 11, Section 3, Part 1 – Air Quality) published in February 2003.

Impact Description

Potential impacts associated with the proposed scheme have been assessed through a description of the impact and consideration of the degree of significance. Impacts have been considered in terms of the following:

Direct or indirect;
Spatial extent: localised (within a few metres) or widespread;
Temporal extent: short term (few days), medium term (months), long term (years);
Reversible or irreversible;
Adverse or beneficial; and
Temporary or permanent.

Assessing the Degree of Significance

The degree of significance of the impact has been considered with respect to its probability of occurrence, the magnitude of change and the sensitivity of the receiving environment. Probability of occurrence is considered in terms of low (0-25%), medium (26-50%), high (51-75%) and very high (76-100%). The sensitivity of the receiving environment will vary depending on the nature of the receptor and have been described as low, medium, high and very high.

There is no set terminology or standards used for the assessment of predicted changes in pollutant concentrations using the DMRB 11 methodology. As such the following terms have been adopted for the description of predicted changes in pollutant concentrations of nitrogen dioxide and PM₁₀ resulting from additional vehicle movements on the local road network:

- 0-1% extremely small;
- 1.01-5% very small;
- 5.01-10% small;
- 10.01-25% moderate; and
- >25.01% large.

10.2.2 Assessment of Potential Impacts

The site has the potential to impact upon air quality during the site preparation, construction, operational and post closure phases.

The potential impacts during the site preparation and construction phase (site infrastructure and cell preparation) have been assessed using data regarding proposed construction methodologies and considering the sensitivity of the proposed development site and the surrounding environment. The main elements of the preparation and construction phases include the construction of fences, access road and access point, cell preparation and shaping and provision of a lining system.

The filling of the site is proposed to progress in parallel with the continuation of the quarrying activities. The site will be filled in a series of 4 No. cells from cell 1 (north east quadrant) clockwise round to cell 4. The cells will then be restored commencing with cell 4 followed by cells 1, 2 and finally 3.

Impacts during the operational phase (i.e. filling of the cells) may include odours, dust generation, emissions from gas flares and engines and exhaust related emissions associated with the use of plant on site, vehicles delivering waste to the site and the transportation of employees.

Impacts have been assessed qualitatively, with the exception of vehicle related exhaust emissions which will be assessed using the DMRB 11 screening methodology.

Sensitive Receptors

Sensitive receptors have been identified in line with the list of generic categories of potential receptors which need to be considered with respect to landfill gas and odour as specified within the EA documents "Guidance on the Management of Landfill Gas" and "Procedures for Identifying Risks from Landfill Sites" Generic. categories of potential receptors are as follows:

- Domestic dwellings;
- Hospitals;

- Schools and colleges;
- Offices, industrial units and commercial premises;
- Sensitive habitats and environmental areas e.g. Sites of Special Scientific Interest (SSSIs), local nature reserves (LNR's) and special areas of conservation (SAC);
- Public footpaths or bridleways;
- Major highways and minor roads;
- Open spaces and parks
- Farmland (crop damage and livestock);
- Air Quality Management Areas;
- Railways;
- Airports.

Sensitive receptors have been identified in relation to the closest distance between the landfill site boundary and the receptor and are summarised in the following table (Table 10.2). Note that the distance of the sensitive receptors from the site boundary have been determined on the basis of the operational areas.

Table 10.2- Identified Sensitive Receptors

Category of Receptor	Receptor and Location
Domestic Dwelling (closer than 50m)	None
Domestic dwellings between 50m and 250m	<ul style="list-style-type: none"> ▪ 5 No. Parry's Cottages (15m) ▪ Ewloe Wood House (205m)
Domestic Dwellings between 250 and 500m	<ul style="list-style-type: none"> ▪ 5 No. Pottery Cottages (320m) ▪ Gell Farm (325m) ▪ Old Farm Cottage (400m) ▪ Penfold Cottage (430m) ▪ Oaks Farm (360m) ▪ The Box (95m)
Hospitals	None within 1Km
Schools and Colleges	None within 1Km
Offices, industrial units and commercial premises (within 500m)	<ul style="list-style-type: none"> ▪ Shell service station, A55 ▪ Holiday Inn, A55 ▪ OK Diner, A55 ▪ McDonalds, A55 ▪ Kirby – Hulme Ltd Legal Services ▪ Dawson Rentals- Truck and Trailers Ltd

	<ul style="list-style-type: none"> ▪ AH Plant Hire ▪ Aggre- Tech ▪ Roberts and Jones Engineering Ltd ▪ CRC Stone ▪ Daniel Utilities ▪ R-A-P Pump centre ▪ General storage and warehouse area ▪ Flintshire County Council depot and offices ▪ Brock Plc Pinfold Lane Quarry ▪ SCANIA ▪ Harridge Tiles (UK) Ltd ▪ Flintshire Crane Hire ▪ Hunter Steel Coatings Ltd ▪ TDG UK Ltd ▪ Various units within the Ewloe Barns Industrial Estate
Sensitive habitats (distances within 2km and within 5 km)	<p>SSSIs</p> <ul style="list-style-type: none"> ▪ Buckley Claypits and Commons <p>SACs</p> <ul style="list-style-type: none"> ▪ Deeside and Buckley Newt Sites
Public footpaths and bridleways	Located within 500m of the site western and northern boundaries.
Major highways and minor roads	<p>Major roads within 500m</p> <ul style="list-style-type: none"> ▪ A55 ▪ A494 <p>A minor road within 500m</p> <ul style="list-style-type: none"> ▪ Pinfold Lane runs parallel to western boundary of site ▪ Magazine Lane near to north-east boundary of site
Farmland	None adjacent to site boundaries

	Within 500m of boundaries: <ul style="list-style-type: none"> ▪ farmland towards north-west, north-east and south
Opens spaces and parks	None within 500m
Air Quality Management Areas	No AQMAs within 500m of site boundary
Railway	Dismantled railway (approx 70m) runs alongside eastern boundary of site.
Airports	Hawarden Airport

Dust Assessment

One of the main impacts during both the site preparation and construction and operational phases relates to the generation and deposition of dust. Dust is defined within in BS6069 (British Standards Glossary of Terms) as *Particulate matter in the range 1-75 microns in diameter*. Dust deposition and dust emissions occur when dust becomes airborne. The generation and deposition of dust varies depending on the prevailing weather conditions, topography and the size of the dust particles generated.

The generation and deposition of dust is most significant during dry conditions and strong winds. Rainfall decreases dust emissions due to surface wetting and increases the rate at which the dust is removed from the air (ODPM, 2005).

The rate and distances for the dispersion of dust particles are dependent on their size. Particles are generally split into 3 categories as follows:

- Small particles <10 µm- may travel distances of up to 1000m
- Intermediate sized particles 10-30 µm- likely to travel distances of between 200-500m
- Large particles >30 µm- generally deposited within 100m of the source

However, all dust concentrations decrease rapidly away from the source of generation as a result of dispersion and dilution.

Small particles (i.e. less than <10 µm) are associated with potential impacts upon human health, whilst the larger and intermediate sized particles are associated with the potential to cause nuisance.

The potential for impacts to occur as a result of dust generation has been assessed in relation to weather conditions and the prevailing wind direction, the proposed activities and the presence and location of sensitive receptors. Wind rose data presented as Appendix 10.2 has been obtained for Hawarden airport for the period January 2001 to December 2005. The data indicates that the most frequent wind direction is from the South East (approximately 21% of the time). However, the most dominant wind direction is from the North West, West and South West (37%).

DMRB 11 Assessment

Following agreement with the Council, the assessment of impacts upon air quality related to traffic has been conducted in accordance with the DMRB 11 screening methodology (Volume 11, Section 3, Part 1- Air Quality) published in February 2003. Concentrations of the most important pollutants emitted from vehicle exhausts at selected receptors are calculated for points within a 200m radius of the emission point. The contribution of vehicle emissions diminishes from the roadside such that their contribution to local pollution levels is not considered to be significant at distances greater than 200m (Highways Agency, 2003). Pollutant concentrations of NO_x, NO₂ and PM₁₀ have been calculated for the various phases of development for the following:

- 2006- Existing baseline scenario;
- Do- Minimum (DM) and Do-Something (DS) without and with development scenarios for the year 2007 (opening year); and
- Do- Minimum (DM) and Do- Something for the year 2010 to allow comparison of the air quality objectives to be achieved by this year

Note that concentrations have only been calculated for NO_x, NO₂ and PM₁₀, following discussions with FCC and on the basis that these are the only pollutants for which potential exceedences of the air quality objectives may occur within the local area.

Pollutant concentrations at selected receptors are determined by applying correction factors based on the type of pollutants, the average speed at which the vehicles are travelling and the distance from the centre of the carriageway to the receptor. The speed correction factors are based upon research undertaken by the Transport Research Laboratory (TRL) involving calculations using the TRL air pollution dispersion model and the distribution of pollutant concentrations observed from air quality measurements from many sites.

Other assumptions are made involving the composition of the vehicle fleet on the road network in future years based upon the proportion of non-catalyst, catalyst and diesel engine vehicles. These assumptions allow projected average pollutant emissions from vehicles to be derived in response to predicted changes in engine technology to satisfy current and pending emission control regulations.

Pollutant concentrations derived from predictive calculations are compared with the Air Quality Objectives (Table 10.1). Note that all calculations were undertaken using the latest version of the DMRB 11 spreadsheet downloaded from the Highways Agency website (version 1.02- November 2003).

Traffic flows have been provided by Veryards Opus as AADT flows. The flows have been allocated to relevant route sections in accordance with the DMRB 11 methodology. Traffic flows have been provided for a limited area in the immediate vicinity of the site where changes in traffic flows are predicted to occur as a result of the development. Traffic flows have been provided for the A494 east and west of the site, Pinfold Lane north and south of the site and the site access road.

Average speed data for the various junctions is not available. As such relevant traffic speeds for the various receptors have been assumed on the basis of the traffic speed limit for the particular route section and the proximity of junctions and traffic lights to each receptor. Information regarding HGV and LDV proportions on the various route sections has been provided by Veryards Opus Ltd.

Background concentrations for hydrocarbons, carbon monoxide, nitrous oxides and particulates have been applied to the contribution of predicted traffic emissions are added. For hydrocarbons, carbon monoxide and nitrous oxides information available from the background pollutant concentration maps produced by the National Environment Technology Centre (NETCEN) has been utilised. In accordance with relevant guidance, a location which is relatively remote from any other traffic sources and is more than 2Km from the development site has been selected to avoid the double counting of vehicle related emissions. Background concentrations from the location at NGR: 325500 366500 have been utilised, with the year adjustment factors used to calculate emissions for future years. Note that the location for the background pollutant concentrations was agreed with FCC (see Appendix 10.1).

Calculations have been undertaken for a number of receptors located in the vicinity of the site. Receptors have been selected on the basis that they may be sites at which persons are present for prolonged periods during the day, and they are likely to represent the most sensitive locations, in terms of their proximity to existing and proposed roads, where traffic levels are predicted to change as a result of the proposed development. Information regarding the model inputs is provided as Appendix 10.3.

A total of 4 No. receptors (see Table 10.3 below) were identified within 200m of the centreline of carriageways where traffic flows may change as a result of the development. Receptors have been selected to include residential properties. Receptor locations are presented as Figure 10.1.

Table 10.3- DMRB 11 Receptors

Receptor Number	Receptor Location
1	5 Pottery Cottages, A494 East of site
2	6 Parry's Cottages, A494 East of site
3	Northwood, A494 West of site
4	Oaks Farm, Pinfold Lane South

10.3 Baseline Air Quality

10.3.1 Site Location

The site is within Alltami, Flintshire. The site is bordered by Pinfold Lane (unclassified Road) to the west, and A494 Mold Trunk road to the south. The Buckley Clay Pits and

Commons SSSI are located along the south-eastern border of the site. A dismantled railway runs in a north – south direction along the eastern boundary of the site. Beyond this there is farmland and a service station and hotel (Holiday Inn) and the main A55 dual carriageway. Several commercial premises and 2 residential properties are located to the north of the quarry.

The site is currently used as a quarry and waste transfer station. The site was granted planning permission to operate as a waste transfer station in October 2004. Existing air quality at the site is therefore influenced by current operations with potential sources of atmospheric emissions including the generation and deposition of dust and vehicle related emissions associated with the provision of waste and removal of raw materials and plant engaged in quarrying activities at the site.

However a number of planning conditions relating to dust were attached to the planning permission for the waste transfer station. Along with existing site practices including the use of wheel wash facilities, these help to reduce the current impact of site operations on air quality.

The planning conditions attached to the waste transfer station state that all practicable means shall be employed to control the generation and dispersal of dust arising from operations on site. The following dust measures are stated:

- the use of a water spray and/ or bowser to damp down dust prone areas;
- control of vehicular speed within the site access and application area;
- regular sweeping and removal of excess material from trafficked areas;
- avoidance of moving and handling materials and stockpiles in dry windy weather conditions without regular wetting of dust prone surfaces;
- minimising the generation of airborne dust during the loading and unloading of road vehicles by minimising the drop height of the materials into the vehicle

In addition, the conditions state that in the event that visible dust emissions occur across the site boundary, site operations should cease until there are no longer any visible emissions from the site.

10.3.2 Baseline Air Quality

Air quality in the site locality may be impacted by atmospheric emissions from a range of sources including:

Point sources: such as stacks (chimneys) that discharge pollutants to the atmosphere principally from industrial processes. The most important of these pertain to prescribed processes authorised under the Environmental Protection Act 1990 and by the Pollution Prevention and Control Act 1999. By their inherent nature such processes have the potential to cause pollution if they are not operated in an appropriate manner with effective pollution control equipment provided to minimise and emissions harmless.

Line Sources: such as railway lines or roads carrying vehicular traffic. Line sources will be locations where emissions of vehicle related pollutants (i.e. diesel powered trains, cars and lorries etc.) are likely to occur.

Area sources: such as open cast mines and landfill sites from which emissions of dust and other pollutants can occur.

A review of data sources and site reconnaissance has been undertaken to determine the location and nature of existing sources of emissions in the locality of the site. These sources include monitoring data and review and assessment documents supplied by FCC and information regarding Authorised Processes.

Point Sources

A desk based review has been undertaken to identify the presence authorised processes. Data available from the Flintshire County Council website indicates that the authorised processes within the site vicinity include a petrol filling station, Hunter Steel Treatments Ltd on Pinfold Lane (authorised for coating of metal and plastic processes) and Deeside Truck Services authorised for waste oil burners.

Line Sources

The closest roads to the site are Pinfold Lane and the A494 (Mold Road). Pinfold Lane provides direct access to the site and to the commercial and residential properties located to the north of the site. The A494 is a main road providing access from the A55 towards the centre of Mold. Traffic data indicates that the A494 has existing 24-hour AADT flows of 20,188. Exhaust related emissions will occur from the use of the roads adjacent to the site. The most important pollutant emitted from road vehicles are:

- Carbon monoxide: A gas which is rapidly absorbed by the blood reducing its oxygen carrying capacity.
- Particulates: the most important of which from the perspective of impacts upon human health are those with aerodynamic diameters of less than 10 micrometres (μm)
- Hydrocarbons: the most significant of which from the perspective of impacts upon human health are benzene and 1,3 butadiene (both are known carcinogens, i.e. have the potential to cause cancer)
- Oxides of Nitrogen: These contribute to photochemical smog and acid deposition.

Area Sources

Area sources of emissions in the vicinity of the site include former and operational landfill sites located within a 1Km radius of the site boundary the Ewloe Barn and Brookhill landfill sites respectively.

Information regarding the sites has been obtained from the Regulation 15 Risk Assessment prepared for the Waste License Application for the Brookhill landfill site. The assessment contains information regarding the Ewloe Barn landfill site (Ewloe Barn

Clayhole) which was operational between 1979 and 1985 and was centred on approximate National Grid Reference SJ278 659 located to the South of the study site. Records indicate that the site was licensed to accept inert waste.

The Brookhill landfill site is centred on approximate NGR SJ 278 656. The site licence was issued in September 1999 and permits the disposal of various waste categories including Municipal Solid Waste (MSW). The site includes a landfill gas and leachate management system.

Any landfill gases generated by the site should be effectively managed by the landfill gas management system. Such emissions are considered to be low and not to be making a significant contribution to local air quality.

Other area sources of emissions within the site vicinity include the Brock Quarry located off Pinfold Lane. Dust may also be generated as part of the activities undertaken within nearby commercial and industrial premises including the Ewloe Barns Industrial Estate.

Monitoring Data

No site specific monitoring has been undertaken to characterise current pollutant concentrations in the site locality. However, existing monitoring data available from FCC has been reviewed. Note that FCC requested that baseline particulate monitoring was undertaken for PM_{2.5} and PM₁₀, timescales did not allow the completion of monitoring for inclusion within this assessment. However, discussions with FCC indicate that they would be prepared to attach a condition to the planning permission to allow the monitoring to be undertaken at a later date.

Monitoring undertaken by FCC within the site vicinity is limited to nitrogen dioxide diffusion tube monitoring. The nearest monitoring site to Parry's Quarry is located at Alltami (NGR 268, 656). The annual mean concentrations are summarised in the table below:

Table 10.4 - Summary of Nitrogen Dioxide Concentrations at Alltami Monitoring Site.

Year and Nitrogen Dioxide Concentration ($\mu\text{g}/\text{m}^3$)				
2001	2002	2003	2004	2005
22	21	19	14	17

The monitoring data indicate that all concentrations are below the annual average objective of $40\mu\text{g}/\text{m}^3$.

Particulate monitoring was undertaken as part of the review and assessment process for the Aston Hill area adjacent to the A494. A continuous monitor was positioned adjacent to the A494 to monitor PM₁₀ concentrations between March 2003 and March 2004. The results presented within the Detailed Assessment document (2004) indicated an annual

mean of $22\mu\text{g}/\text{m}^3$. This does not exceed the annual mean objective to be achieved by 2004. However, DMRB 11 modelling indicates that the provisional annual mean objective to be achieved by 2010 would be achieved.

Air Quality Review and Assessment Documents

A Stage 1 and 2 Air Quality Review and Assessment Report was published by FCC in March 2001, an Updating and Screening Assessment Report was then published in July 2003, followed by a Detailed Assessment in July 2004 and an Annual Air Quality Progress Report in 2005. The reports have been reviewed and the main findings are presented below.

The Stage 1 and 2 Air Quality Review and Assessments concluded that there was no requirement to proceed to Stage 3 or to declare any Air Quality Management Areas (AQMA).

The 2003 USA report considers sources of pollutants in Flintshire and significant sources in neighbouring local authorities. Detailed assessment was only considered necessary for nitrogen dioxide, PM_{10} and sulphur dioxide. The assessment addressed the main sources of each of the pollutants and concluded that further assessment work was required for nitrogen dioxide and PM_{10} in relation to monitoring and modelling for the A494 and A550 route sections. The results of the first month of monitoring undertaken at the Aston Hill area, Queensferry close to the A494 indicates the presence of potentially elevated concentrations of PM_{10} and NO_2 and thus the need for further monitoring and detailed assessment.

The detailed assessment report produced in 2004 comprised a review of the annual monitoring undertaken for NO_2 and PM_{10} at Aston Hill and modelling using the DMRB 11 Screening Method. Data from the continuous air quality monitor indicated the presence of annual average NO_2 concentration of $40.56\mu\text{g}/\text{m}^3$ and PM_{10} concentration of $22\mu\text{g}/\text{m}^3$. Further modelling was done using DMRB 11 and indicated a breach of the provisional annual mean PM_{10} objective to be achieved by 2010.

An annual progress report was produced in 2005. The report focuses in NO_2 and PM_{10} concentrations and considers any new emission sources and monitoring and modelling data. The report indicates that following the proposed widening of the A494 at the Aston Hill area in Queensferry, the annual average objectives for PM_{10} and NO_2 are likely to be achieved.

Complaints

Information provided by FCC indicates that complaints have been received regarding dust nuisance in the site locality. The complaints have been received from the FCC depot site regarding road dust and from Ewloe Wood House regarding dust from Hunters and the nearby quarries.

10.4 Assessment of Potential Impacts on Air Quality

The proposed landfill may have an impact upon air quality during the site preparation, construction, operational and post closure phases.

10.4.1 Site Preparation and Construction Phase

The site preparation and construction works will comprise the provision of site infrastructure and initial cell preparation.

The initial site preparation works will comprise the following:

- Construction of 4m closed timber boarding fence along the northern site boundary
- Filling of vegetation gaps along the eastern and western site boundaries.
- Construction of enhanced access point for vehicles onto Pinfold Lane
- Construction of internal haul road
- Establishment of infrastructure including construction of weighbridge, waste reception office, administration office and welfare facilities.

The works to the cells will comprise the preparation and shaping of the landfill base and the sidewalls, the emplacement of a liner and geotextile and the initial construction of the leachate collection system. Additional preparatory works are required for Cell 4 including the construction of an external retaining wall to the south west quadrant of the site to ensure full enclosure of the landfill void.

Impacts during the site preparation and cell construction phases have been considered in relation to the potential for the generation and deposition of dust and vehicle and exhaust related emissions.

Dust

The potential for dust generation and nuisance is likely to be greatest during the undertaking of the initial site preparation phase including the construction of the site haul road and construction of site services. Dust generation during the cell preparation will be limited by the fact that a majority of the work will be undertaken within the quarried void, at levels below the surrounding area and will therefore be sheltered from external winds, restricting the potential for dust dispersion beyond the site boundary.

The main impact upon air quality during the site preparation and construction phases is likely to result from the generation of dust from:

- Mechanical disturbance from the movement of vehicles along dry, unpaved haul roads (prior to the construction of the surfaced haul road) and the re-suspension of dust from the movement of vehicles along surfaced roads.
- Uncovered and unvegetated stockpiled materials;
- Mechanical disturbance of materials during construction activities e.g. earthworks;
- Earth moving and handling operations.

Dust emissions can lead to increased dust deposition and elevated particulate concentrations in the atmosphere. The potential effects resulting from dust generation are as follows:

- Nuisance to nearby site users through soiling of windows, cars, hanging washing etc;
- Damage to vegetation and sensitive habitats;
- Health effects resulting from exposure to particulates.

Site procedures relating to dust include the provision for daily and monthly site inspections, minimising soil handling operations during high winds and using a dust suppressant on site haul roads as required. The potential for dust deposition beyond the site boundary will be further minimised through the provision of a 30m buffer zone, the retention of existing site mature vegetation present along the western and eastern boundaries and the provision of further planting and the timber fence along the northern site boundary.

Nuisance to Nearby Site Users

The nearest site users include business premises to the north and west of the site. A footpath located off Pinfold Lane to the west of the site, residential receptors including Ewloe Wood house to the north west of the site the Box to the north east of the site and Parry's Cottages to the south east of the site. The Holiday Inn, and the associated restaurants located to the east of the site off the A55.

The potential for the deposition of dust beyond the site boundary will be reduced by the 30m buffer zone, the presence of vegetation around a majority of the site perimeter and the proposed site procedures relating to dust management. On the basis of the wind rose data (Appendix 10.2), any dust generated on site is most likely to be deposited within areas to the north east, east and south east (37% of time) and areas to the north west (21% of the time).

On the basis of the wind rose data and the position of receptors in the site locality it is considered that impacts to nearby land users would be minor, adverse and direct, occurring over the short term, localised in scale and reversible and temporary in nature.

Vegetation and Sensitive Habitats

Vegetation and sensitive habitats in the site locality include the SSSI located directly to the south of the site and the trees and other vegetation present around the site perimeter.

Dust deposition within the SSSI and perimeter vegetation may result in the smothering of plant leaves and a reduction in photosynthetic rate decreased growth rate and in extreme circumstances, changes in substrate (soil) composition due to potentially contrasting physico-chemical properties of deposited dust compared within in-situ soils. Where it has been recorded excessive dust levels in the atmosphere have been present.

On the basis of the wind rose data, site generated dust is only likely to be deposited within the SSSI approximately 25% of the time. A further and more detailed assessment of the potential impacts of dust on the SSSI and protected species is provided within the Ecological Assessment (Section 11). However, potential impacts are considered to be minor, adverse and direct, localised in nature occurring over the short term and reversible and temporary in nature.

Vehicle and Exhaust Related Emissions

Traffic levels on roads in the vicinity of the site are also likely to increase during the site preparation and construction phases through the use of vehicles by construction workers, the delivery of plant and equipment. In addition, plant used on site may make a small contribution to local pollutant emissions.

Exhaust emissions would be produced by plant and machinery utilised during cell preparation and construction phase. Plant would include the following:

- 2 No. 360° excavators
- Dump truck
- Bulldozer
- Roller

Exhaust emissions from mobile plant will only be significant within a 200m radius of the emission point. In such areas site users and residents may be exposed to slightly higher vehicle pollutant concentrations than typical background levels. The only receptors located within a 200m radius of the site boundary where persons may be present over a prolonged period are Parry's Cottages and the Box. On the basis of the limited amount of plant required on site, it is not considered that vehicle related emissions will make a significant contribution to local air quality. Impacts are considered to be minor, adverse and direct, occurring over the short term, localised in scale, reversible and temporary.

10.4.2 Operational and Post Closure Phase

The filling of the site is proposed to progress in parallel with the continuation of the quarrying activities. The site will be filled in a series of 4 No. cells from cell 1 (north east quadrant) clockwise round to cell 4. The cells will then be restored commencing with cell 4 followed by cells 1, 2 and finally 3.

It is anticipated that it will take approximately 20 months to fill each cell up to the existing grade and then a further 20 months to fill the cells above grade to the final height.

During the filling of Cell 1, the gas management plant will be constructed including piping valves overall system control, gas extraction blowers and a maximum of 3 No. gas utilisation engines and flares.

The potential impacts during the operational and post closure phases have been assessed with respect to the following:

- Landfill gas generation associated with the degradation of wastes within the site and lateral migration
- Emissions from engines and flares
- Odour
- Global warming and ozone depletion potential
- Dust
- Traffic and vehicle related emissions associated with the use of plant on-site and vehicles delivering waste materials to the site.

Impacts resulting from the decomposition of waste within the site and the associated production of landfill gas and emissions from the flares and engines have been assessed qualitatively. The impacts will be assessed quantitatively within the IPPC application. Impacts associated with the release of exhaust emissions from additional vehicle movements on the local road network have been assessed quantitatively using the DMRB 11 screening methodology.

The magnitude of impact upon potentially sensitive receptors will vary depending on the area of the cell being filled and on the positioning of each particular operational activity relative to the location of the receptor. Furthermore, each type of receptor will be sensitive to different aspects of the landfill operation. For example, occupants of residential properties may exhibit sensitivity to odour whereas vegetation within ecologically sensitive habitats may be sensitive to deposition of dust.

Site procedures will be adopted for the operational phase to help reduce potential impacts relating to dust and odour. Site procedures relating to dust include the provision for daily inspections, minimising soil handling operations during high winds, using a dust suppressant on site haul roads as required and the vegetating of inactive areas as required in order to reduce the potential for the re suspension of loose particles. In addition, a wheel wash facility will be utilised to reduce the potential for the tracking of mud and dust particles beyond the site boundary.

Odour relating to waste materials will be minimised through the provision of daily cover materials over all exposed waste materials to a depth of 150mm. In the event that odours occurred from landfill gas, the problem would be investigated. The investigation would consider issues such as gas generation rates and the areas of the problem and would identify potential methods to reduce the odours utilising the gas collection system.

Impacts relating to Landfill Gas Generation and Lateral Migration

The main bulk landfill gas components are as follows; methane, carbon dioxide, oxygen, nitrogen, hydrogen, carbon monoxide and water vapour. The composition of the landfill gas will vary over time as the waste degrades and as a function of the following (taken from the EA, 2004 "Guidance on the management of Landfill Gas"):

- Differences in waste composition, pre-treatment and storage;
- Changes in the rate and predominant form of microbial activity (e.g. aerobic/ anaerobic);

- Time since the emplacement of the waste;
- Gas management regime;
- Hydraulic characteristics of the waste;
- Physico-chemical properties of waste components;
- Differing properties of the components of the landfill gas;
- Landfill temperature.

There are a number of pathways through which receptors may be exposed to landfill gas emissions. Landfill gas may be released directly to the atmosphere through the site surface, or from waste prior to capping. Gas may migrate laterally from the site through the ground or along service ducts or pipelines.

The gas produced within the site will be managed through the provision of an engineered cap and liner and the installation of a network of gas collection wells and pipes, linking into a landfill gas plant. The liner will comprise a non woven geotextile with a geomembrane and a drainage layer comprising crushed stone. The site will be capped with a layer of low permeability soil material (typically clay) which will in turn be covered with soils to a depth of at least 150mm to allow final restoration. However, all waste will be covered over at the end of each working day with suitable daily cover materials to a depth of 150mm.

The containment afforded by the liner will be augmented by active management of gas generated within the site throughout the operational phase and for an extended period following final waste deposition and site restoration. A comprehensive system of gas collection wells is proposed with gas being routed to a gas flare or gas utilisation plant. Flaring of gas will commence once waste deposits within the cells reach a depth of 10m. There will also be up to 3 No. engines present on the site, with the number of engines in operation increasing in line with increases in gas production. Following completion of waste deposition at the site, gas flaring will continue for a period estimated at up to 100 years. Collection and destruction or utilisation of gas in this manner will ensure that gas pressure does not build up within the waste mass, a factor that could otherwise enhance the risk of lateral gas migration.

Monitoring of gas quality, gas yield and gas pressure will be carried out during the operational life of the site and thereafter to allow effective management of gas flare and gas utilisation plant. The monitoring will also serve the purpose of confirming the effectiveness of the site lining and capping. Gas monitoring boreholes will be installed within the site and around the site perimeter to allow the characterisation of gas and the early detection of gas migration in the extremely unlikely event of a loss of containment.

On the basis of the above, it is not considered that landfill gas emissions are likely to be a source of significant impact. Landfill gas emissions would only pose a potential risk to identified receptors in the event that there was a problem with the gas collection systems, such that the gas being produced was not being collected and was instead

venting directly to the atmosphere or migrating laterally away from the site. The impacts associated with the potential for migration of landfill gas are considered to be adverse and direct be of minor significance occurring over the long term (i.e. operational and post closure phase), temporary and reversible and of a localised nature.

Emissions from Flare and Engines

The gas collection wells will link into the existing gas flare and engine. There may be a direct release of combustion products as a result of incomplete combustion. Exhaust emissions may include the following:

- Carbon dioxide;
- Carbon monoxide;
- Nitrogen oxides;
- Hydrogen chloride;
- Hydrogen fluoride;
- Particulates;
- Non-methane Volatile Organic Compounds.

The gas utilisation plant will be located in the north eastern corner of the site. The closest receptors to the gas utilisation plant include the Box residential property located approximately 100m to the north of the site and Ewloe Wood House, located over 200m from the site in Pinfold Lane. Other site users close to the gas utilisation plant include the warehouses and SCANIA site located approximately 100m to the west.

Emissions from the gas utilisation plant are likely to increase slightly over the existing baseline as a result of the input of additional landfill gas and may therefore have a very minor impact on nearby receptors. However, operational monitoring will be undertaken in line with Environment Agency requirements as outlined within the documents; TGN05, TGN08 (2004) and the "Guidance on Landfill Gas Flaring" (2002). The monitoring will determine the magnitude of emissions from flares and engines to ensure that these do not reach an unacceptable level. Monitoring will be undertaken in accordance with Environment Agency guidance and will include nitrogen oxides, carbon monoxide, and VOCs.

The impacts of emissions from the flares and engines will vary over the operational and post closure phases of the landfill site. However, through the control over emissions that would be provided through monitoring, impacts would be minor, adverse and direct, localised occurring over the long term (i.e. operational and post closure phase), reversible and temporary.

Odour

Odour may be generated through the degradation of waste within the landfill sites and the generation of landfill gas and leachate. Odorants reported in landfill gas include; hydrogen sulphide, organosulphur compounds, carboxylic acids, aldehydes and carbon disulphide. Odour generated at the site will vary depending on the types of waste

deposited and the conditions at the time of placement. The potential for odour to cause a nuisance is dependent on meteorological conditions namely, wind direction and the presence of nearby receptors with individuals who may be adversely affected by the odour, with the offensiveness of an odour being highly subjective and varying from one individual to another.

Potential source of odours on-site include the following:

- Disposal of odorous wastes- with potential odour issues prior to deposition or from wastes within exposed or uncapped areas of the cell;
- Gas extraction systems;
- Leachate wells and monitoring points.

The impact of potential odours at the site would be mitigated through the adoption of good operational practices at the site including the provision of daily cover at the end of each working day. Measures to minimise odour associated with waste materials include the following:

- Immediate compaction of waste following deposition and placement of daily cover;
- In the event that operational procedures were ineffective, odour masking or neutralising agents would be employed as necessary.
- Routine inspection of gas extraction and collection systems to ensure that there is no potential for leakage

The potential for migration of odour beyond the site boundary resulting from landfill gas management would be reduced as a result of the gas collection system. The potential for complaints resulting from odour from the site is also likely to be reduced as a result of the 30m buffer zone around the site perimeter.

The potential for odour nuisance to adjacent land users will vary depending on the area of the site being filled and the proximity of sensitive receptors, the nature of the waste received, weather conditions (particularly with respect to wind speed and direction and temperature). According to the EA (2002), there is likely to be a higher degradation of putrescible material during hot weather. The potential for odour nuisance is therefore likely to be greatest during the placement of odorous waste and hot weather. On the basis of the wind rose information receptors located to the north west of the site are likely to be impacted more frequently than those in other areas of the site.

The closest receptors to each of the cells are as follows:

- **Cell 1-** The Box (end of Pinfold Lane), restaurants located to the east of the site
- **Cell 2-** Parry's Cottages (south) and hotel located to the east of the site
- **Cell 3-** FCC and other offices and business uses located to the west
- **Cell 4-** SCANIA and other business and industrial users located to the north and north west of the site and Ewloe Wood House located to the north of the site.

In the event that odours are generated at the site, they should be identified and rectified during the routine site inspections. This should ensure that odour nuisance does not occur. In the event that odours do migrate from the site, impacts are likely to be direct, localised or widespread depending on weather conditions and wind direction, be of short term in duration and temporary in nature and both irreversible and reversible.

The risk of complaints regarding odour nuisance is considered to be low, and restricted to limited periods when odorous wastes are being placed at the site prior to the provision of daily cover and/or capping.

Global Warming and Ozone Depletion Potential

The main components of landfill gas are methane and carbon dioxide. These are both greenhouse gases which contribute to global warming. The provision of the engineered cap and lining and provision of the gas collection and utilisation system will reduce diffuse atmospheric emissions of landfill gases.

Furthermore, the use of landfill gas in the manner proposed will ensure the conversion of a significant proportion of the methane collected to carbon dioxide prior to emission to atmosphere. The effect of such conversion is beneficial in that carbon dioxide is a substantially less powerful greenhouse gas than methane. Irrespective of this, any landfill gases released to the atmosphere have the potential to contribute to global warming. On the basis that the efficiency of the capping, lining, gas collection and utilisation plant will be monitored, atmospheric emissions of landfill gas are likely to be very limited and thus will not make a significant contribution to UK emissions of greenhouse gases. The impacts are considered to be negligible to minor, adverse, indirect, occurring over the long term (i.e. duration of the operational and post closure phase) and widespread in scale. The contribution of the project to global warming would be temporary i.e. occurring over the duration of the operational and post closure phases of the scheme. However, the potential contribution of the impacts on climate change may be both temporary and permanent. The impacts on climate change are considered to be both irreversible and reversible and may vary over the lifetime of the scheme depending on policies implemented at a local to international scale with respect to reducing the impacts of climate change.

Dust

The potential for dust generation during the operational phase of the site would be limited to the wind scouring of deposited wastes awaiting capping and materials retained within temporary stockpiles (such as daily cover and capping materials), and the re-suspension of deposited particles on the internal road and areas of hardstanding.

The same general principles apply to the assessment of the risk of impact upon air quality from dust during the operational phase as to the construction phase. Dust may be generated when dry wastes are tipped from delivery vehicles and manoeuvred into final position by a dozer employed at the tipping face. If particles are deposited on the haul road during dry periods, they may be re-suspended as vehicles travel along the

road from the site access point to the tipping area. In addition, during dry periods particles may be scoured from any temporary stockpiles of fine material being stored for use as daily cover. The potential for dust generation from the haul road will be limited through the provision of a tarmac surfacing and the use of a road sweeper on the internal haul road to remove mud and dirt from the surface.

The potential for dust generation for half the placement of waste within the cells will be limited by the fact that the actual tipping and compaction of waste will be undertaken within a void at levels below the surrounding area and will therefore be sheltered from external winds, restricting the potential for dust dispersion beyond the site boundary.

The receptors most likely to be impacted by dust generation include the residential receptors located within 100m of the site boundary (i.e. the Box and Parry's Cottages). Given the proposed dust control measures to be employed at the site it is considered that potential impacts would be minor, adverse, direct, localised in nature and occurring over the short term and would be reversible and temporary.

Traffic and Vehicle Emissions

The traffic data provided Veryards Opus Ltd indicated increases in traffic flows on the A494 both east and west of the site, Pinfold Lane up to the point of the new site access road and Pinfold Lane to the south of the site.

The results of the predictive calculations undertaken using the DMRB 11 screening methodology are provided as Appendix 10.4. This includes the increases in concentrations between the DM (no scheme) and DS (with scheme) scenarios and the respective percentage changes in concentrations.

The results indicate predicted increases in concentrations of NO_x, NO₂ and PM₁₀ for the DS scenario, reflecting the increases in traffic flows and the proportion of HGVs on the local road network.

The magnitude of change in pollutant concentrations varies between the different receptors on the basis of the predicted increases in traffic flows and as a function of the distance of the receptors from the centre of the route section. The greatest increases in pollutant concentrations are predicted for receptor 1. The increases in pollutant concentrations and description of significance following the criteria adopted are as follows:

- Receptor 1;
 - PM₁₀ + 0.05 to + 0.07 µg/m³ (+0.25 to +0.33%)- extremely small
 - NO₂ +0.2 to +0.24 µg/m³ (+1.19 to +1.23%)- small
- Receptor 2;
 - PM₁₀ +0.02 to +0.03 µg/m³ (+0.12 to 0.17%)- extremely small
 - NO₂ +0.11 to +0.13 µg/m³ (+0.82 to +0.85%)- extremely small

- Receptor 3;
 - PM₁₀ +0.01 to +0.02 µg/m³ (+0.08 to +0.11%)- extremely small
 - NO₂ +0.06 to +0.07 µg/m³ (+0.38 to +0.41%)- extremely small
- Receptor 4;
 - PM₁₀ +0.02 to +0.03 µg/m³ (+0.13 to +0.18%)- extremely small
 - NO₂ +0.12 to +0.14 µg/m³ (+1.04 to +1.10%)- small

The data indicate that the predicted increases in concentrations of PM₁₀ and NO₂ are all small or extremely small.

Comparison of the predicted concentrations with the air quality objectives indicates that there are no exceedences of any of the objectives. The PM₁₀ concentrations predicted at receptor 1 for 2010 are close to the provisional annual mean objective to be achieved by this year of 20 µg/m³.

On the basis of the very small increases pollutant concentrations predicted, it is not considered that increases in vehicle movements predicted to occur would have a significant impact on local air quality. The impacts on local air quality would be negligible, adverse, direct, localised in scale, occurring over the short term, reversible and temporary.

Exhaust emissions would also be produced by plant utilised on site during the operational phase of the scheme. However, such emissions are likely to be very limited.

10.4.3 Cumulative Air Quality Impact

It is understood that there is a proposal to improve the A55 junction adjacent to the Parry's Quarry site. There are currently two possible routes for the improved junction. One of which involves the widening of Pinfold Lane adjacent to the site. It is recognised that due to the close proximity of this route, it is likely to have an impact on local air quality. Air quality is likely to deteriorate at receptors located within a 200m radius of any new route sections, with improvements in air quality at any receptors located within a 200m radius of any roads where traffic flows decrease as a result of the scheme.

10.5 Mitigation Measure

10.5.1 Site preparation and Construction Phase

Mitigation measures for the site preparation and construction phase are considered with respect to potential impacts relating to dust and vehicle and exhaust related emissions.

Dust

A Construction Environmental Management Plan (CEMP) will be prepared prior to the commencement of any site preparation and construction activities on site and should include the following measures in relation to the control of dust on site:

- Spraying of site access roads and dampening of material stockpiles

- Inspection of local highways to check for dust deposition
- Locating of stockpiles away from sensitive receptors taking into account prevailing wind directions
- Sensitive timing of potentially dusty activities in relation to prevailing weather conditions
- Provision of windbreak netting around stockpile areas
- Undertaking of on-site materials handling in enclosed areas
- Use of dust suppression tools for all operations
- Speed limits for vehicles travelling within site
- Provision of method statement by contractor detailing methods for dust control and suppression and undertaking of dust monitoring around site perimeter a necessary.

Vehicle and Exhaust Emissions

Measures should also be included within the CEMP to reduce the impact of exhaust related emissions from the use of plant and machinery on site and vehicles associated with the construction phase travelling on the local road network as follows:

- Ensure all construction plan and equipment is well maintained and in good working order and routinely inspected to help minimise emissions
- Turn off idling engines when not in use to help reduce emissions
- Use of agreed pre defined routes for construction traffic to avoid densely populated and congested areas and peak hours

10.5.2 Operational and Post Closure Phases

Mitigation measures during the operational and post closure phases have been considered in relation to the potential impacts. On the basis that procedures relating to the operation of landfill sites have been defined in a number of Environment Agency documents, additional mitigation is not considered to be necessary for a number of potential impacts.

The mitigation measures outlined for the site preparation and construction phases for dust and vehicle and exhaust related emissions should also be applied to the operational phase where appropriate.

On the basis of the very small increases in concentrations of PM₁₀ and NO₂ predicted due to increases in traffic flows on the local road network, it is not considered that specific mitigation is required.

However, it is considered that site specific procedures should be established for the following:

- Management and monitoring of particulates (including dust)
- Management and monitoring of odour
- Stack and engines emissions monitoring and maintenance
- Landfill gas management plan

10.6 Residual Impacts

10.6.1 Construction Phase

The main potential impacts during the construction phase relate to the potential for the generation and deposition of dust which has the potential to cause a nuisance to adjacent site users, residential receptors and vegetation. Other impacts include exhaust emissions associated with the transportation of employees and goods to the site and the use of plant on site.

Mitigation measures include the preparation of a CEMP which would include a comprehensive range of dust reduction, suppression and control techniques as well as methods to reduce the potential impact of exhaust related emissions. It is considered that with the implementation of a CEMP the potential for dust generated within the site to cause a nuisance to adjacent site users would be limited to periods when strong winds coincide with very dry periods and that impacts are reduced to being negligible to minor

The implementation of mitigation measures regarding exhaust emissions should ensure that these do not have a significant impact on local air quality and residual impacts are therefore considered to be negligible.

10.6.2 Operational Phase

A range of potential impacts upon air quality have been identified for the operational phase of the site including the generation of gases within the site and the potential for lateral migration, emissions from flares and engines, odours, impacts upon global warming and ozone depletion, dust generation and deposition and traffic and vehicle related emissions.

The adoption of standard operational procedures and compliance with Environment Agency requirements will adequately reduce potential impacts upon air quality and nearby sensitive receptors. This will be further enhanced through the implementation of site monitoring protocols and procedures such that any impacts on adjacent land users will be negligible.

10.7 Conclusions

The tables presented in Appendix 10.5 summarise the impacts relating to air quality during the construction and operational phases and the likely residual impacts resulting from proposed mitigation measures.

Existing air quality within the locality of the site is influenced by current site operations comprising quarrying and the waste transfer station and including the potential generation and deposition of dust and vehicle related exhaust emissions. Other contributions to pollutant concentrations in the site vicinity include former and operational landfill sites and other industrial land users.

Potential impacts upon air quality have been identified for both the construction, operational and post closure phases of the site. These have been assessed using both quantitative and qualitative techniques.

The potential impacts during the construction phase including the potential for dust generation and deposition and vehicle related exhaust emissions. A CEMP will be produced prior to the commencement of construction activities and will include several measures to control and prevent dust nuisance and exhaust emissions.

Potential impacts during the operational and post closure phases including the production of landfill gases as a result of the degradation of waste materials within the site, odours, emissions from gas flares and engines, dust generation and depositions and exhaust emissions from vehicles delivering waste materials to the site.

A majority of the potential impacts during the operational and post closure phases will be mitigated through the adoption of standard operating procedures and compliance with Environment Agency requirements. Lateral migration of landfill gas will be prevented through the provision of an engineered liner and cap and a gas management system including wells and pipes connected to the gas plant. Operational monitoring will be undertaken to ensure that emissions from flares and engines do not reach unacceptable levels. Potential nuisance regarding dust and odour will be identified during the daily routine inspection and measures implemented to rectify such issues as required.

Modelling has been undertaken using the DMRB 11 screening methodology to consider potential increases in concentrations of NO₂ and PM₁₀ at receptors located on the A494 and Pinfold Lane where traffic flows are predicted to increase as a result of the transportation of waste to the site. The results of the modelling indicate very small increases in concentrations of NO₂ and PM₁₀. As such no specific mitigation is warranted in this respect.

11.0 ECOLOGY

This ecological impact assessment for Parry's Quarry, Alltami, Flintshire comprises several separate parts. The first three parts comprise survey work to characterise the baseline ecological conditions around the site. These are followed by an ecological impact assessment and production of an Ecological Management Plan for the SSSI/SAC part of the site. The assessment comprises:

- Description of the legislative framework governing nature conservation in the UK
- A desk study, based on existing records of protected species, proximity to statutory or non-statutory designated sites, consultation with various nature conservation organisations and a number of previous ecological surveys of the site.
- An ecological walk-over and extended Phase 1 Habitat survey of the site, carried out in 2006.
- A series of protected species surveys carried out in 2006, comprising a breeding bird survey, a badger *Meles meles* survey, a great crested newt *Triturus cristatus* survey and a habitat based reptile survey for the site.
- An ecological impact assessment for the development of the quarry into a domestic landfill site, comprising (a) impact assessment (b) recommended mitigation measures and (c) further assessment of residual impacts after mitigation
- Production of an outline Ecological Management Plan for the SSSI part of the site.

11.1 General Site Description and Previous Works

Parry's Quarry is a working quarry with ongoing excavation. In the past it has contained a number of large, deep lagoons, created by previous mineral extractions. In August 2006 these lagoons had been reduced to two due to continued earth working, particularly in the north eastern section of the quarry. The site is bordered to the south by the A494(T), to the east by a dismantled railway and the A55(T), to the west by Pinfold Lane and to the north by a minor road. There are semi-mature woodland and scrub boundaries around the edges of the site. Most of the site comprises bare earth and rock with sparse colonising weedy ephemeral vegetation in places.

Parry's Quarry is now owned by Robin Jones and Son, having previously been owned by Hanson (see Section 1). During the time that Hanson Bricks owned the site, great crested newts were found to be using a water body on site and due to the removal of a rock face, it became possible for amphibians to enter the working area (Hodnett, 2000). As part of a mitigation strategy it was decided that the breeding pond which was then threatened was to be filled in and a receptor site (ponds and terrestrial habitat) created in the southern area of the site. This area of the site is now designated as a Site of Special Scientific Interest (SSSI) and Special Area of Conservation (SAC) as part of the Buckley Claypits and Commons SSSI and part of the Deeside and Buckley Newt Sites SAC.

11.2 Legislation

Below is a brief summary of the legislation relevant to the sites, habitats and protected species covered in this report:

11.2.1 Status of Habitats and Species

The ecological assessment is designed to evaluate the status of habitats and species covered by European and British legislation and by both UK and local (Flintshire) Biodiversity Action Plans. There are three types of relevant protection:

1. Statutory instruments;
2. Statutory and non statutory designated sites;
3. UK Biodiversity Plan and Flintshire Biodiversity Action Plan

Statutory Instruments

EU directives adopted by the UK as Acts of Parliament and National Policy include:

Wildlife and Countryside Act 1981 (as amended). Protected species are those listed in Schedules 1 (protected birds), 5 (protected animals), 8 (protected plants) of this Act.

Schedule 1 of WCA 1981 (as amended) lists all birds for which it is illegal to disturb or destroy either the birds or the nest, except by license from the Countryside Council for Wales (CCW). The WCA1981 (as amended) also makes it illegal to disturb the nests of most British birds during the breeding season (described as early April to late August).

Schedule 5 of the WCA 1981 (as amended) lists all animals which are protected. The degree of protection varies. All reptiles are protected. Common reptiles are protected from unlawful killing; protection measures do not require a license. Rare reptiles require a protection and conservation scheme for which CCW grants a special license. Great crested newts require a protection and conservation scheme for which CCW grants special licenses. While water voles receive no protection for the animal itself, it is an offence to disturb the animal while occupying a place of shelter and the water vole's habitat is also protected.

Schedule 8 of the WCA 1981 (as amended) lists plants which are protected. There is also a list of plants which it is an offence to introduce into the wild.

- EU Directive on the Conservation of Natural Habitat and Wild Flora and Fauna (***The Habitats Directive***) (Directive 92/43/EC)
- EU Directive on the Conservation of Wild Birds (***The Birds Directive***) (Directive 79/409/EC)

- **Protection of Badgers Act (1992).** Any development which involves destroying an active sett or handling animals, requires a license from CCW.

11.2.2 Status of Protected Sites

Statutorily designated sites

There are five types of statutorily designated sites which provide protection for both habitats and associated protected species. These are National Nature Reserves (NNRs) and Sites of Special Scientific Interest (SSSIs), both designated under the Wildlife and Countryside Act (1981 as amended), plus Special Areas of Conservation (SACs), designated under the EC Habitats Directive, Special Protection Areas (SPAs), designated under the EC Wild Birds Directive and Ramsar Sites, which are listed under the Convention on Wetlands of International Importance, of which the UK is a signatory. All terrestrial Ramsar sites, National Nature Reserves, Special Protection Areas and Special Areas of Conservation are also SSSIs under National Legislation.

Parry's Quarry lies at the northern edge of a group of separate areas which are together designated as the Buckley Claypits and Commons SSSI and part of the Deeside and Buckley Newt Sites SAC. The site designation and map are provided in Appendix 11.2. The site consists of a number of former clay pits which are now ponds and is designated primarily for its large breeding population of great crested newt (*Triturus cristatus*), its assemblage of five different amphibian species and its mosaic of acidic, neutral and marshy grassland with wet heath, tall herb and shrub.

Non-statutorily designated sites

There are many types of protected areas which are not afforded statutory protection but which nevertheless have been designated for their national, regional or local value. These include: Local Nature Reserves (LNRs), designated and managed by local authorities, National Trust reserves, other NGO reserves, such as those belonging to or managed by County Wildlife Trusts, RSPB, John Muir Trust, Plantlife, Woodland Trust, etc, and other Wildlife Sites, including various types of sites designated by local authorities, such as Biological Heritage Sites (BHSs).

There are no non-statutory designated sites close to Parry's Quarry.

11.2.3 Specific Protection Relevant to Species at Parry's Quarry

Protection Afforded to Amphibians

Great crested newt is fully protected under Schedule 5 of the Wildlife and Countryside Act (1981, as amended) and under Annex II and IV(a) of the European Union's Habitats and Species Directive (EU Directive 92/43/EEC : Conservation of Natural Habitats and Wild Fauna and Flora) which is translated into UK legislation in The Conservation (Natural Habitats, &c.) Regulations 1994. Legal protection is afforded to the species and

its habitat at all stages of its life cycle. Great crested newt has also been identified as a Priority Species by the UK Biodiversity Group. Under the legal protection afforded great crested newt it is an offence to deliberately/intentionally kill, harm, injure or disturb a great crested newt. It is also an offence to damage, destroy or obstruct access to any structure or place used for shelter, protection or breeding by the species; or to disturb it while it is occupying such a structure or place

Protection Afforded to Badger

Badgers and their setts are protected under the Protection of Badgers Act 1992. This means that it is unlawful to knowingly kill, capture, disturb or injure an individual or intentionally damage, destroy or obstruct an area used for breeding, resting or sheltering by badgers. The Protection of Badgers Act is essentially animal welfare law as opposed to conservation legislation (as is provided by Schedule 5 of the Wildlife and Countryside Act 1981, as amended). Specifically, badgers are generally too common to be included under Schedule 5 of the Wildlife and Countryside Act. The Protection of Badgers Act is not therefore intended to prevent work when badger setts are present but rather to ensure that the animal's welfare is preserved. This is ensured through a licensing system which is operated by the Countryside Council for Wales. The definition of a sett, is given as "any structure or place which displays signs indicating current use by badger." CCW interpret the law relatively widely and consider 'current use' as whether the sett provides seasonal use at some time during the course of the year (even if it is not used for the whole year). In effect, any hole showing actual or likely badger occupation within the last year should therefore be treated as a sett under the legislation.

Protection Afforded to Breeding Birds

Legislation relevant to birds is found within the Wildlife and Countryside Act 1981 (as amended). Specifically this legislation makes it an offence for any person to "kill, injure or take any wild bird; or to take, damage or destroy the nest of any wild bird while that nest is in use or being built; or to take or destroy an egg of any wild bird." Birds listed on Schedule 1 of the Act are afforded special levels of protection. Likewise, certain species are excluded from this protection. These are listed in Part II, Schedule 2 of the Act and include what are typically regarded as pest species. The legislation states that an authorised person shall not be guilty of an offence by reason of "the taking, damaging or destruction of a nest site" or by the "taking or destruction of an egg of such a bird" listed in Part II, Schedule 2. Species included on this list which may be encountered on the site include carrion crow *Corvus corone*, magpie *Pica pica* and woodpigeon *Columba palumbus*. It should also be noted that both house sparrow *Passer domesticus* and starling *Sturnus vulgaris* are also included on this Schedule. However, these species are likewise included on the Red List of birds of high conservation concern. For these species, whilst the destruction of a nest site would not represent an offence under the Wildlife and Countryside Act, it would always be recommended that impacts on nest sites should be avoided.

Protection Afforded to Reptiles

With regard to reptiles, all native reptiles are listed on Schedule 5 of the Wildlife and Countryside Act (1981, as amended) and are afforded different levels of protection. For

the four most commonly occurring species (adder *Vipera berus*, grass snake *Natrix natrix*, slow-worm *Anguis fragilis* and common lizard *Lacerta vivipera*), the protection extends to against killing and injury although does not include habitat protection. In practice, where located, the legislative protection requires that a translocation programme is undertaken to make 'reasonable effort' to remove animals prior to the commencement of any site preparation or development. Captured animals are subject to the various provisions of the Protection of Animals Act (1911), the Welfare of Animals During Transport Order (1994) and once released, the Abandonment of Animals Act (1960).

11.2.4 UK Biodiversity Action Plan and Local (Flintshire) Biodiversity Action Plan

The UK Biodiversity Action Plan (UKBAP), published in 1994, sets out the broad strategy and targets for conserving and enhancing wild species and habitats over the next twenty years. It provides action plans for over 300 priority species and 30 key habitats. A further report published in December 1995 and endorsed by government in May 1996, provides detailed proposals for a large number of species and habitats which require urgent conservation action. The UK plan together with the individual action plans therefore provides the framework for the effective delivery of biodiversity conservation at the national level and provides the UK commitment to the Biodiversity Convention signed at Rio in 1992. Consideration of the UK plan and in particular those species and habitats which have been identified as requiring urgent conservation action is therefore important in any Ecological Assessment.

Specific to this report, there are a number of species potentially occurring within the study area which have their own National Species Action Plan. Such species include great crested newt (*Triturus cristatus*), pipistrelle bat (*Pipistrellus pipistrellus*), lesser horseshoe bat (*Rhinolophus hipposideros*), tree sparrow (*Passer montanus*), song thrush (*Turdus philomelos*) and bullfinch (*Pyrrhula pyrrhula*).

Counties have now prepared their own Local Biodiversity Action Plans. These LBAPs identify species and habitats of regional importance and these are also considered to be of importance in an Ecological Impact Assessment. As with national biodiversity conservation, at the local level, species and habitats requiring urgent conservation action have been identified. These are detailed within the Flintshire Local Biodiversity Action Plan ('Creating Space for Wildlife'). Thus, the survey also aimed to assess the suitability of habitats on site for habitats and species which have actions plans in the Flintshire Local BAP. These are:

Habitats:

- Boundary and linear features

Species

- Badger
- Barn Owl

- Lesser horseshoe bat
- Reptiles

11.3 Methodology for 2006 Surveys

11.3.1 Extended Phase 1 Habitat Survey

The survey followed the methodology of JNCC (1992), in which the key habitats on site were identified and mapped, with the addition that all species of flora and fauna observed during the survey were recorded and all habitats were assessed for their suitability for protected species. All plant species were recorded according to Stace (1997). The results of the Phase 1 Habitat survey informed the need for further more detailed protected species surveys, as described below.

11.3.2 Amphibians

A CCW Level I survey of all potential breeding ponds on site and within 500m of the site boundary was undertaken between 23rd March and 8th June, 2006. For ponds where great crested newt were confirmed, a Level III survey was undertaken, where possible (ponds were holding very little water by June). An assessment of the terrestrial habitat was also a consideration. The survey was undertaken in accordance with CCW published standard guidelines (Great Crested Newt Guidance Note Number 7, Version 2002/1), and involved a combination of techniques, where practical.

The waterbodies within the working part of the quarry and one lagoon in the quarry to the west which were excluded from survey on health and safety grounds. The rationale for exclusion was agreed with Mathew Ellis at the local offices of the Countryside Council for Wales (Mold) and is included as Appendix 11.3.

As water shrew *Neomys fodiens* was noted during torch surveys of the ponds within the SSSI on 23rd March 2006, bottle trapping techniques were not employed during the remaining great crested newt surveys for this site. This was due to the risk that water shrew could become trapped in bottle traps and suffocate. This approach was undertaken with agreement with CCW in line with the English Nature (2001) Great Crested Newt Mitigation Guidelines which state '*Where the consultant considers that there is a reasonable chance of capturing other protected species (e.g. water shrews), steps should be taken to address appropriate licensing issues, to modify trapping methods, or to avoid trapping altogether as necessary*'.

11.3.3 Badger

A detailed badger survey was undertaken in April and May, 2006. This involved an initial walkover survey to identify sett locations, together with other field signs present such as paths, hairs, footprints, latrines, snaffles etc. Where field signs were encountered, these

were investigated further, particularly with respect to establishing the location of any main setts.

11.3.4 Birds

A detailed walkover survey of the site was undertaken at the same time as the repeat amphibian surveys, between 23rd March and 8th June, 2006. All bird species were recorded onto maps to enable an assessment of the importance of the site to be made, not only in the terms of species present, but also in terms of the significance of the populations of the individual species. During each of the surveys, species noted by sight or call were recorded on to maps. Singing birds are territorial and their presence is regarded as being indicative of a territory and likely evidence of breeding. Night visits were also undertaken to establish the presence of any nocturnal species.

11.3.5 Reptiles

The survey was carried out in May, 2006. The first stage of the survey was to walk the site to identify potentially suitable habitat. This was identified on the basis of key considerations such as vegetation, cover and aspect. During the walkover survey, suitable habitat on the site was walked to search for direct observations of animals during optimum survey conditions. In addition any natural refugia on site were examined for basking reptiles.

11.4 Assessment of Existing Biological Information and Records

11.4.1 Records of Protected Species

Information on existing records of protected species proximate to the site was sought from a number of organisations, including the Countryside Council for Wales, North Wales Environmental Information Service (Cofnod), North Wales Wildlife Trust, North East Wales Wildlife and the Clwyd Badger Group.

11.4.2 Statutory Designated Sites

The southern portion of the Parry's Quarry site is part of the Buckley Clay Pits and Commons SSSI and part of the Deeside and Buckley Newt Sites SAC, designated in 2003 for the value of habitats for great crested newt (*Triturus cristatus*). The designation description and map for this site is provided in Appendix 11.2.

11.4.3 Non-Statutory Designated Sites

There are no known non-statutory designated sites within 3km of Parrys Quarry.

11.4.4 Consultation

Consultation has been carried out with the following organisations:

- Countryside Council for Wales (CCW)
- North East Wales Wildlife (NEWW)
- Clwyd Badger Group

Countryside Council for Wales

The results of ecological surveys, the ecological impact assessment and proposed mitigation methods, including a management plan for the SSSI/SAC were discussed with Matthew Ellis of CCW's Mold Office. CCW was concerned to ensure the future protection of the existing SSSI/SAC and to make sure that the overall management strategy for the Buckley Clay Pits and Commons SSSI and part of the Deeside and Buckley Newt Sites SAC can be achieved in relation to this site which currently is the most northerly of several small component sites. To this end, discussion included extending the SSSI/SAC to the north and along the adjacent disused railway line, connectivity of the railway line under the A494 to the south and to Alltami Brook to the north, and to ensure that a management plan was prepared for the SSSI/SAC, together with future arrangements put in place for manpower to carry out that management. CCW proposed that NEWW could take over management of the SSSI/SAC, given an appropriate annual sum, commuted specifically for this purpose.

North East Wales Wildlife (NEWW)

NEWW has much experience over many years of managing sites and assessing populations of great crested newts in and around the Buckley Commons and Clay Pits. Discussions took place with Pip Perry (NEWW) regarding the future management of the SSSI/SAC area of the site. In principal, NEWW are keen to take over management of the area, assuming that suitable conditions can be agreed and a contract drawn up between all parties.

Clwyd Badger Group

Clwyd Badger Group provided details of fifty past known locations of badger setts, within 2km of the Parry's Quarry site. Of these, only six are recorded as being active/occupied in 2005/2006. The sett located immediately east of the Parrys Quarry site close to the disused railway line appears to date from 1986. All other proximate setts to the site are located either on the opposite side of the A55 or along Alltami Brook between 0.2-1.4km to the west on the western side of Pinfold Lane.

11.4.4 Results of Previous Ecological Surveys

Habitats

A number of previous ecological surveys of the site have been carried out, including a Phase 1 Habitat survey, badger, breeding birds and reptile surveys in 2004 as part of the Environmental Statement, prepared by the Environmental Advice Centre (now Amec

E&E) (2004) to accompany a planning application for a waste transfer station on the site. The results of these surveys indicated a variety of habitats were present on site, ranging from open earthworks and stockpiled rubble and earth in the central, active portions of the site, to semi-natural grassland, scrub woodland and ponds within the SSSI and semi-mature woodland and scrub surrounding the site boundaries. Only the peripheral woodland as well as the grassland and wetland habitats in the SSSI to the south of the site were considered to be of ecological value whilst the unworked grassy areas within the quarry were considered to be of only low ecological value.

Protected species

Consultation in 2004 highlighted species records for only great crested newts on site. A previous survey undertaken in 1997 by Epcad discovered great crested newts (GCN) on the southern part of the site, leading to its exclusion from the proposed development and the creation of a 'newt receptor' area close to the southern boundary, designed to receive GCN and other amphibians translocated from other ponds in the quarry. This newt receptor area has since been designated as both a SSSI and as a SAC (Special Area of Conservation).

During 1999, 107 great crested newt, 335 smooth newts, 68 toads and 2 frogs were translocated to the newt receptor area at the southern end of the site. The site is considered to be of high value and part of a set of complex sites in the area that are host to great crested newt. The report produced in 2000 as part of the amphibian assessment found GCN in only the most southerly pool and palmate newts in only the two larger pools, the north easterly pool and the most southerly.

Previous bird surveys identified linnet and song thrush which are UKBAP species and BTO (British Trust for Ornithology) Red List species, along with 6 species highlighted as Amber List species by the BTO.

The site was searched in 2004 for signs of badger activity. No setts or latrines were found, only evidence of runs and some footprints. It was considered that the site was used for foraging, offering reasonable habitat, but was of low value to badgers in the area, due in part to (a) the extensive on site workings and (b) the availability of good foraging areas off site close by.

Potential for the site to be used by other protected species is limited to reptiles. Grass snake had been observed on site during the translocation exercise in 1999. A reptile refuge search was carried out in 2004 but no signs of any animals were found. The southern part of the site, within the SSSI is considered to be of potential value for grass snake.

11.5 Ecological Field Survey Results

11.5.1 Results of Phase 1 Habitat Survey

The Phase 1 Habitat survey was carried out on 24th May, 2006. The survey identified a range of habitats, the locations of which are illustrated in Figure 11.1. Plant species identified on site are listed in Appendix 11.1a. Phase 1 Habitat map Target Note numbers are annotated on Figure 11.1 and Target Notes are given in Appendix 11.1b. Much of the site consists of exposed earth and rock, along with deep quarried excavations (some up to 40m deep), as a result of the active quarrying activities on site.

Pond Habitat

To the south of the planning application boundary is the designated SSSI/SAC, which spans approximately 100m in length and 50m wide. This area consists of overgrown semi-natural neutral grassland with patches of scrub woodland (primarily rapidly growing goat willow saplings). The area has two small ponds, one of which was dry at the time of the first survey in May, 2006; while both ponds were completely dry at the time of a second survey in early August 2006. The largest of the two ponds is approximately 20m in length and 8m wide. The eastern end of this pond was dominated by greater reedmace (*Typha latifolia*) along with a surviving cover of yellow water lily (*Nuphar lutea*). There are also several small patches of yellow flag iris (*Iris pseudacorus*). The smaller pond to the east of this is approximately 10m by 10m in dimension. Approximately 60% of its surface is covered in common reed (*Phragmites australis*), with a further 20% covered in greater reedmace (*Typha latifolia*). Much of the rest of the pond margins are covered in a mixture of water mint (*Mentha aquatica*) and a small patch of purple loosestrife (*Lythrum salicaria*). The ponds are open in aspect, with no shading from trees or shrubs. Further detailed description of these ponds, together with photographs, is provided in connection with the amphibian surveys in Section 11.6.2 below.

Open Grassland and Tall Ruderals

The area surrounding the ponds consists of a mixture of rank grasses and tall ruderals. Dominant species in this area include creeping thistle (*Cirsium vulgare*), common knapweed (*Centaurea nigra*), ragwort (*Senecio jacobaea*), yarrow (*Achillea millefolium*), with Yorkshire fog (*Holcus lanatus*) and cocksfoot (*Dactylis glomerata*). Wetter margins around the larger pond contain soft rush (*Juncus effusus*) and hard rush (*Juncus inflexus*) as well as *Deschampsia cespitosa*. To the south of the ponds is a 10m high embankment covered in immature tree species dominated by silver birch (*Betula pendula*) and sycamore (*Acer pseudoplatanus*) between 5 and 8m tall, with patchy bramble (*Rubus fruticosus*) scrub. This is surrounded by patchy scrub and rank grassland including broadleaved dock (*Rumex obtusifolius*) and common ragwort (*Senecio jacobaea*).

Semi-mature Broadleaved Woodland

The main access road indicated on the site map in Figure 11.1 marks the eastern extent of the quarrying activities, skirting along the northern edge of the SSS and bending

northwards at the corner of an area of mixed broadleaved woodland located at the south east corner of the site. This woodland is dense, up to 8m tall and is dominated by oak (*Quercus robur*) silver birch (*Betula pendula*) and sycamore (*Acer pseudoplatanus*). Hazel (*Coryllus avellana*) is present in the understorey, and a dense herb and shrub layer is dominated by ferns (*Dryopteris felix-mas*), ivy (*Hedera helix*) and bramble (*Rubus fruticosus*).

The eastern boundary of the site consists of semi-improved grassland, which is crudely landscaped to produce a ridge along this boundary. A line of earthworked material is stacked in an 8m tall ridge west of this grassland. A former railway line runs parallel to the eastern site boundary. This is now overgrown and vegetated with dense woodland and scrub. The main woodland trees are oak, with some sycamore and silver birch, with hawthorn (*Crataegus monogyna*), bramble and nettle (*Urtica dioica*). The wooded former railway line lies at approximately 4m below the level of the grassland within the quarry site.

A small valley area of damp ground extends from mid way along the eastern boundary of the site towards the former railway line. This area is surrounded by relatively tall (10m) mature oak, ash (*Fraxinus excelsior*) and sycamore, with hawthorn and an understorey of bramble. The central part of this valley was damp at the time of the survey in May, 2006 and dominated by horsetail (*Equisetum arvense*) and bittersweet (*Solanum dulcamara*).

The western boundary of the site consists of a 30m wide band of semi-natural broadleaved woodland situated on a ridge between 10 and 15m above the quarry. The woodland consists mainly of oak and silver birch between 5 and 10m in height. The northern most point of this band of woodland is very steep, descending down towards the excavated lagoon.

In summary, the boundaries of the site consist of semi-mature woodland dominated by sycamore, silver birch, oak and hawthorn with, in places, a dense understorey consisting of either bramble or bracken. The SSSI/SAC designated area to the south of the planning application boundary consists of overgrown unimproved grassland with dense stands of invasive tall ruderals. The two ponds present within the designated area are becoming increasingly terrestrialised and dried out with vigorous stands of *Typha latifolia* and, in one pond, *Phragmites australis*.

11.5.2 Results of Survey for Amphibians

Surveys for great crested newts were carried out between 23rd March and 8th June 2006. There are two ponds within the SSSI at the southern end of the quarry and one defunct pond on the eastern boundary of the site. There are an additional five ponds within 500m of the site boundary. Pond descriptions and the survey results for the ponds on site and ponds within 500m of the site boundary are provided below. A Pond Location Plan is provided as Figure 11.2.

There are also three lagoons within Parry's Quarry and one lagoon in the quarry to the west which were excluded from survey on health and safety grounds. The rationale for their exclusion is provided as Appendix 11.3.

Pond 1

SJ 276 662

On site



Pond description

A small oval pond of approximate dimensions 10m by 3m. Located within the SSSI and within the area enclosed by permanent newt fencing this pond is shallow with well vegetated banks. Marginal species include soft rush *Juncus effusus* while a stand of great reedmace *Typha latifolia* is present within the pond itself. This pond only holds water at certain times of year, confirmed by the fact that it was completely dry for several of the survey visits. The base of the pond is muddy with some areas suitable for males to display. Surrounding the pond is an area of calcareous grassland with log piles providing hibernacula for newts. Species within the calcareous grassland include common knapweed *Centaurea nigra*, creeping thistle *Cirsium arvense*, broad-leaved dock *Rumex obtusifolius*, ribwort plantain *Plantago lanceolata*, great willowherb *Epilobium hirsutum*, water mint *Mentha aquatica*, common bird's-foot trefoil *Lotus corniculatus*, colt's-foot *Tussilago farfara*, bush vetch *Vicia sepium*, creeping buttercup *Ranunculus repens*, red campion *Silene dioica*, sweet vernal-grass *Anthoxanthum odoratum*, ox-eye daisy *Leucanthemum vulgare*, yarrow *Achillea millefolium*, common nettle *Urtica dioica*, hard rush *Juncus inflexus*, common centaury *Centaureum erythraea* and common ragwort *Senecio jacobaea*. The surrounding grassland also has patches of willow *Salix* sp. scrub.

Survey results

Date	Survey Type	Species identified	Gender
23.03.06	Egg search	negative	
23.03.06	Torch survey	Great crested newt Smooth/palmate Water shrew	3 male 1 female 2 unknown 15male 6 female 1
11.04.06	Pond dry	No newts	
25.05.06	Egg search	Negative	
25.05.06	Torch survey	No newts	
01.06.06	Pond dry	No newts	
08.06.06	Pond dry	No newts	

Pond 2

SJ 276 662

On site



Pond description

A round pond of approximate dimensions 12m by 12m within the SSSI and surrounded by permanent newt fencing. Marginal and emergent species noted include common reed *Phragmites australis*, greater reedmace, bittercress sp. *Cardamine* sp., branched bur-reed *Sparganium erectum*, bittersweet *Solanum dulcamara*, yellow flag iris *Iris pseudacorus*, water mint, water forget-me-not *Myosotis scorpioides*, brooklime *Veronica beccabunga* and great willowherb. Aquatic species include common duckweed *Lemna minor*, rigid hornwort *Ceratophyllum demersum*, water-plantain *Alisma plantago-aquatica*, broad-leaved pondweed *Potamogeton natans* and common water-starwort *Callitriche stagnalis*. The pond is surrounded by calcareous grassland with species including common knapweed, creeping thistle, broad-leaved dock, ribwort plantain, great willowherb, water mint, bush vetch, creeping buttercup, red campion, sweet vernal-grass, ox-eye daisy, yarrow, common nettle, hard rush, common centaury, common ragwort, meadow vetchling *Lathyrus pratensis*, compact rush *Juncus conglomeratus* and common sorrel *Rumex acetosa*. Log piles surrounding the pond provide suitable hibernacula for newts. The base of the pond is muddy and the water depth is approximately 50cm.

Survey results

Date	Survey Type	Species identified	Gender
23.03.06	Egg search	Negative	
23.03.06	Torch survey	Great crested newt	4 male 3 female
		Smooth newt	8 female
11.04.06	Egg search	Negative	
11.04.06*	Torch survey	Great crested newt	1 male 3 female
		Smooth/palmate	12
25.05.06	Egg search	Positive for GCN	
25.05.06	Torch survey	Great crested newt	1 male 1 female
		Smooth newt	2 male 16 female
		Palmate	5 female
01.06.06	Egg search	Positive for GCN	

01.06.06**	Torch survey	Great crested newt Smooth newt Palmate newt Unidentified newt	3 male 2 female 7 male 9 female 7 male 5 female 1
08.06.06	Torch survey	Pond almost dry – No newts	
09.06.06	Egg search	Negative	

*Pond being bottle surveyed by Jacobs Babbie

**Counts recorded are an underestimate as the pond was covered with common duckweed. This was swept away to allow the survey to take place although this is likely to have spooked some individuals causing them to move quickly away before being recorded.

Pond 3

SJ 277 666

On site



Pond description

A defunct pond within a hollow to the east of the site. This pond is completely choked with accumulated leaf litter and is heavily shaded by the scrub and trees including cherry

sp., on the steep banks of the hollow. There is no marginal or aquatic vegetation and a covering of green algae on the surface of the damp mud.

Survey results

No surveys were carried out as this pond is defunct and has not held water at any point during the survey period.

Pond 4

SJ 274 668

193m from site boundary



Pond description

A large circular pond of approximate dimensions 20m by 20m. It is shaded by surrounding mature trees. The base is silty and the depth in the centre likely to be considerable. The margins are fringed with dense stands of yellow iris. Aquatic vegetation comprises a dense covering of common duckweed.

Survey results

Date	Survey type	Species
11.04.06	Egg search	Negative
11.04.06	Torch survey	No newts
25.05.06	Egg search	Negative
25.06.06	Torch survey	No newts Many tadpoles

01.06.06	Egg search	Negative
01.06.06	Torch survey	No newts
08.06.06	Torch survey	No newts

Pond 5

SJ 272 664

295m from site boundary



Pond description

A small rectangular roadside pond with a small amount of standing water, this pond is of approximate dimensions 10m by 3m. It is heavily shaded by the roadside hedgerow and is clogged with tipped debris and accumulated leaf litter. It is surrounded by dense bramble *Rubus fruticosus* agg. Aquatic vegetation comprises abundant common duckweed, ivy-leaved duckweed *Lemna trisulca*, broad-leaved pondweed, water horsetail *Equisetum fluviatile* and water plantain.

Survey results

Date	Survey Type	Species identified	Gender
11.04.06	Egg search	Negative	
11.04.06*	Torch survey	Smooth/palmate newt	4
25.05.06	Egg search	Negative	

25.05.06	Torch survey	Smooth newt Palmate newt	3 female 2 female
01.06.06	Egg search	Negative	
01.06.06	Torch survey	Great crested newt	1 female
08.06.06	Torch survey	Pond almost dry – No newts	

* Pond being bottle surveyed by Jacobs Babbie

Pond 6

SJ 272 664

180m from site boundary



Pond description

A roadside pond which only holds water in the occurrence of high rainfall. It is shaded by the roadside hedgerow and it completely choked with accumulated leaf litter and tipped debris. There are no marginal or aquatic species present. The pond is becoming overgrown with bramble scrub and tall ruderal vegetation which surrounds it.

Survey results

Date	Survey type	Species	Gender
11.04.06	Pond dry	No newts	
25.05.06	Egg search	Negative	
25.06.06	Torch survey	Unidentified newt	1
01.06.06	Pond dry	No newts	
08.06.06	Pond dry	No newts	

Pond 7

SJ 276 659

315m from site boundary



Pond description

A large irregularly shaped pond of approximate dimensions 30-40m by 10m. The base is silty and the depth in the centre is likely to be considerable although the margins are shallow (<30cm). The pond is shaded in parts by mature hawthorn which surrounds the pond. The water clarity is good and the margins are vegetated with stands of soft rush. Other species are effectively an extension of the adjacent arable field.

Survey results

Date	Survey type	Species
11.04.06	Egg search	Negative
11.04.06	Torch survey	No newts

Access was denied by the landowner for all subsequent visits due to the presence of livestock in the fields.

Pond 8

SJ 277 657

495m from site boundary



Pond description

A series of damp hollows which are likely to be seasonal in nature. The main section of open water is shaded by mature trees and scrub including European gorse *Ulex europaeus*, hawthorn *Crataegus monogyna*, bramble and oak *Quercus* sp. The waterbody is in the region of 4m by 4m and is heavily choked by leaf litter. Marginal vegetation comprises soft rush, great willowherb, common nettle and floating sweet-grass *Glyceria fluitans*. The earth banks are approximately 20cm in height and the surrounding area is very damp. The maximum water depth is approximately 30cm although most of the pond is shallower than this.

Survey results

11.04.06	Egg search	Negative
11.04.06	Torch survey	No newts

Access was denied by the landowner for all subsequent visits due to the presence of livestock in the fields.

11.5.3 Results of Badger Survey

A number of badger runs were identified along the southern and eastern boundaries of the site. In addition a number of snaffles (diggings for roots) were found in these areas. The location of these badger field signs is shown on Figure 11.3. There appear to be some old runs along the western boundary but non representing recent activity. Despite extensive searching, thick scrub made surveying the entirety of the boundaries difficult and no badger sett was identified.

A single badger was observed in the torch beam during a great crested newt survey within the SSSI on 25th May 2006. The badger was travelling from the southern boundary of the SSSI into the rough grassland of the SSSI. When disturbed by the torchlight, it headed back in the direction it had come from.

11.5.4 Results of Breeding Bird Survey

Figure 11.3 provides a map showing records of all breeding birds noted and Appendix 11.1c provides a full bird species list of all species noted on the site.

During the breeding bird survey bullfinch *Pyrrhula pyrrhula*, blackbird *Turdus merula*, blue tit *Parus caeruleus*, great tit *Parus major*, wren *Troglodytes troglodytes*, chaffinch *Fringilla coelebs*, willow warbler *Phylloscopus trochilus*, chiffchaff *Phylloscopus collybita*, robin *Erithacus rubecula*, dunnock *Prunella modularis*, blackcap *Sylvia atricapilla*, song thrush and woodpigeon were noted to be using the scrub/woodland boundaries around the edge of the quarry. In addition, these substantial semi-mature boundaries are considered to be suitable to support other species observed on the site including magpie, carrion crow and jackdaw *Corvus monedula*.

In the dense woodland/scrub boundary to the south, a green woodpecker *Picus viridis* was observed which is of interest. Species observed but which are unlikely to be breeding on site and are just likely to be using the site for foraging are buzzard *Buteo buteo*, swallow *Hirundo rustica* and herring gull *Larus argentatus*. The buzzard is likely to be breeding in a more substantial area of woodland nearby and the swallow is likely to be utilising buildings in the surrounding area. The quarry itself has no suitable buildings for nesting swallow as all the structures on site are temporary 'portakabin' style units.

11.5.5 Results of the Reptile Survey

With regard to reptiles, the survey was based on the identification of suitable habitat and the inspection of natural refugia on site. No reptiles were noted on site during the course of the surveys. Although there are some areas of the site which seem to have potential as reptile habitat such as the gravely areas and bunds with colonising vegetation, the fact that these habitats have only been established fairly recently as a by-product of the quarrying activities and the disturbance likely to be caused to these habitats by the quarrying machinery suggests reptiles such as common lizard and slow worm are unlikely to be encountered on the site. The boundaries on the site are too densely vegetated and provide too much shade to be of any potential for reptiles. Grass snake habitat, however, is present over the majority of the site due to the presence of the numerous waterbodies. The SSSI is particularly suitable for grass snake due to the presence of the ponds and the variety of habitats providing suitable areas for basking and suitable areas for cover. In addition, this area has an abundance of amphibians, providing high quality foraging for grass snake. Whilst grass snake is a rare species locally, there have been records of grass snake being present on the site previously (Hodnet 2000) and therefore there is a possibility they will still occur, despite the high levels of disturbance.

11.6 Assessment of Ecological Value

11.6.1 Habitats

There are two areas on and around the Parrys Quarry site which are considered to be of ecological value. These are:

- The area of the SSSI in the south of the site which incorporates both terrestrial open grassland/tall ruderal habitat and pond/wetland habitat
- The semi-mature woodland which surrounds the eastern, western and part of the southern boundaries of the site

The value of these locations for protected species is described below.

11.6.2 Amphibians

The area to the south of the quarry working area and to the south of the planning application boundary is designated as part of the Buckley Claypits and Commons SSSI and part of the Deeside and Buckley Newt Sites Special Area of Conservation (SAC). The overall SAC is located around the northern and eastern boundaries of the town of Buckley and, in total, covers an area of 99.7ha. It is of special interest for its population of great crested newt, its assemblage of widespread amphibian species, and for its mosaic of semi-natural grassland.

Water bodies at Buckley Claypits and Commons support one of the largest breeding populations of the great crested newt in Great Britain. Torch night counts undertaken

during the spring have revealed over 100 adult and sub-adult animals on several occasions. Great Britain is considered to support one of the strongholds for this species in Western Europe. These water bodies also support significant populations of other amphibian species including smooth newt *Triturus vulgaris*, palmate newt *Triturus helvetica*, common frog *Rana temporaria* and common toad *Bufo bufo*. Many of these waterbodies have been created by past mineral exploitation. Others have been created for stock watering purposes whilst more recently they have been created specifically to conserve the amphibian populations.

Surrounding areas of land support a mosaic of habitats including dry and wet semi-improved and improved grasslands, lowland dry and wet heath, tall herb, bracken, scrub and secondary woodland. Lowland dry and wet heath are an uncommon habitat type in North East Wales. This mosaic of habitats forms an important foraging, sheltering and overwintering area for adult and juvenile amphibians.

Therefore, the SSSI/SAC area of the Parry's Quarry site, with two ponds for breeding habitat, an area of calcareous grassland for foraging and areas of scrub and log piles representing optimal terrestrial habitat, is of undoubted importance in the context of the site and is of very high importance in the local and regional context. The fact that water shrew was observed in the area during the first torch survey, enhances its status as a wildlife area. The maximum great crested newt count for the SSSI ponds on any one night is 13 individuals which would be classed as a medium population using English Nature guidelines guidance for population class assessment. However, on the basis that Buckley Claypits and Commons SSSI great crested newt population is known to be of 'exceptional' status (CCW), the population within the SSSI should be regarded as high for the purposes of this assessment.

It was, however, noted that the ponds within the SSSI suffer from drying out and on several visits the more westerly of the two ponds held no water at all. While the other pond appears to hold water more consistently, the levels were very low during the later visits, with all previously identified egg-laying material now dried up or well above the water line. This problem must therefore be a consideration of the future management of this area.

The quarry working area of the site is considered to be of low potential for amphibians. There are no foraging opportunities as the majority of the area is bare rock and the lagoons, although extensive, have little (in most cases none at all) vegetation. They therefore do not represent optimal breeding habitat, as there would be nowhere for eggs to be laid. However, due to the fact that the permanent amphibian fencing around the SSSI is not continuous, there is always the possibility that amphibians could find their way into the quarry itself.

11.6.3 Badger

Badger is a widespread species in the North Wales area, although has recently been included on the Flintshire Biodiversity Action Plan. A single badger was observed on the

site, although no setts were identified within the site boundary, the presence of a sett cannot be ruled out given the density of the scrub within the southern boundary making access for survey impossible.

The site does provide limited foraging opportunities for badger, restricted to the grassland of the SSSI, but the majority of the site is rock or loose gravel which would not represent suitable foraging habitat for badger. There is good quality foraging habitat in the surrounding area, and indeed other parts of the wider area outside and surrounding the Parry's Quarry site which appear to offer more suitable habitat for badger than the site itself.

11.6.4 Birds

The UK's birds can be divided into three categories of conservation importance according to the British Trust for Ornithology. Red is the highest conservation category, amber is the next most critical group, followed by green, which have no identified threats to the status of their populations.

The Red List refers to species of high conservation concern and which have experienced a decline in their breeding population in excess of 50% (Criteria 1), or contraction in their UK breeding range in excess of 50% in the last 25 years (Criteria 2). Other criteria for inclusion on the Red List are that the species is Globally Threatened (Criteria 3) or that there has been an historical population decline in the UK during 1800-1995 (Criteria 4).

The Amber List refers to species of medium conservation concern and which have experienced a moderate decline in their breeding population of between 25-49% over the last 25 years (Criteria 1), or a contraction in their UK breeding range in excess of between 25-49% in the last 25 years (Criteria 2). Other criteria for inclusion on the Amber List are, that the species has seen a historical population decline between 1800-1995 but that the population has more than doubled over the last 25 years (Criteria 3), that the species has seen a moderate decline (25-49%) in the UK non-breeding population over the last 25 years (Criteria 4), that the species has an unfavourable conservation status in Europe (Criteria 5), that the species has a 5 year mean of 1-300 breeding pairs in the UK (Criteria 6), that in excess of 50% of the UK breeding population is in 10 or fewer sites (Criteria 7), that in excess of 50% of the UK non-breeding population is in 10 or fewer sites (Criteria 8), that in excess of 20% of the European breeding population is in the UK (Criteria 9), and that in excess of 20% of the north-west European (wildfowl), East Atlantic Flyway (waders) or European (others) non-breeding population is in the UK (Criteria 10).

With regard to birds song thrush and bullfinch are listed on the British Trust for Ornithology Red List of Species of High Conservation Concern and willow warbler, dunnock, swallow and green woodpecker are listed on the Amber List of Species of Medium Conservation Concern. In addition, song thrush and bullfinch are also UK BAP species.

As with the other species considered in this report, the working area of the quarry has no potential as a breeding bird habitat. It has high levels of disturbance and is a constantly changing habitat. The semi-mature boundaries around the edge of the site are the most valuable areas of the site in terms of breeding birds and the highest levels of bird activity were recorded from these areas. These boundaries are relatively dense and well structured in most parts, and are species diverse. The eastern and southern boundary of the site are wooded embankments while the boundary along the eastern edge is within the hollow of the disused railway. These boundaries support a range of species in reasonably high numbers.

11.6.5 Reptiles

Reptiles are listed as a target group on the Flintshire Local Biodiversity Action Plan (Creating Space for Wildlife). The site is considered to offer very limited potential for reptiles, with the exception of grass snake which may be using the waterbodies on site, particularly within the SSSI. The presence of grass snake would be notable as it is an uncommon species in the local area.

11.6.6 Bats

Although no site-specific survey was carried out to determine the use of the site by bats, the boundary woodlands which surround the site provide good linear flight lines for bats and it is likely that these parts of the site are used by bats such as Pipistrelles, for foraging and commuting. The trees bounding the site are semi-mature and are all in generally good condition. They do not in the main provide suitable roosting niches for bats. A very few semi-mature sycamore will be removed to make way for an enhanced site entrance. These trees were not considered to provide suitable roosting niches for bats. This, combined with the fact that no buildings will be demolished, no other suitable bat roosting sites will be affected by the propose creation of a landfill site and no floodlighting nor night-time activities are proposed, means that bats and potential impacts on bats or bat roosts will not be considered further in this report.

11.7 Ecological Impact Assessment

There is no statutorily required methodology for carrying out environmental impact assessment in the UK. In this part of the ES the proposed method is derived from more general environmental impact assessment (EIA) methodology, including that published specifically for ecological impact assessment (EcIA) by the Institute of Ecology and Environmental Management (IEEM) (2006). There are three clear stages in this impact assessment:

- **Impact assessment**
- Proposed **mitigation measures**
- Assessment of **residual impacts** after implementation of mitigation

The Ecological Impact Assessment process is applied to construction, operational and land restoration stages of the proposed landfill site development.

11.7.1 Methodology for Assessment of Potential Ecological Impacts.

An outline of the development proposals has been compared with the findings of the baseline ecological survey to predict the impacts that may result from the development. Then the following assessments are made:

- Step 1: Standard set of *descriptions* for each identified impact;
- Step 2: Assessment of the *scale* of impact, the *value and sensitivity* of the receiving environment and the *likelihood* of the impact occurring;
- Step 3: Determination of the *degree of significance* of the impact.

Thus, each identified impact would first be *described*, then its significance would be *rated*. The description provides a qualification of the impact in the context of the site.

Description of Ecological Impacts

The following criteria are considered when *describing* each impact:

- Direct or indirect;
- Spatial extent: localised (within a few tens of metres), widespread (over a whole catchment for example);
- Temporal extent: short term (few days), medium term (months) long term (years);
- Reversible or irreversible.

Assessing the Degree of Significance of the Environmental Impact

Once identified and described, the evaluation of the degree of significance of each impact is based on (1) assessment of the *value* and sensitivity of the environmental/ecological receptor and (2) the *magnitude* of the impact. This evaluation provides a level of significance for each impact.

- The *value* of an ecological receptor is assessed according to whether the habitat or species is of international, national, regional, county, district or parish importance. In addition, the value is determined by habitat integrity, coherence and intactness. Consideration is given to nature conservation and ecological contexts of affected receptors including species, populations, communities, habitats and ecosystems.
- The *magnitude* of the impact is assessed according to spatial and temporal extent, combined with the probability of occurrence. Also taking into account the vulnerability of the habitat or species to the change caused by the development, and its ability to recover

Ecological habitats are valued according to widely accepted criteria of which the most important are naturalness, extent, rarity and diversity; these and others are described in extensive literature. Existing statutory and non-statutory designations for nature conservation and amenity value are also taken into consideration.

Biological species are similarly valued according to accepted criteria and the extent to which they are under threat. The importance of species to wider communities is considered. Protection of species by the relevant legislation, including the *Wildlife and Countryside Act (1981)*, *Countryside and Rights of Way Act (2000)*, *the Conservation (Natural Habitats &c) Regulations (1994)* and non-statutory guidance including the UKBAP and LBAPs are taken into account.

Using value and magnitude characteristics, the significance of each environmental impact is determined. Significance is determined by the interaction of these factors, with the extreme conditions being high for large effects on receptors of high value and lower or insignificant for smaller effects on receptors of lower value. In this EIA, following IEEM (2006), there are four degrees of significance

The *rating* of an impact is the assessment of its degree of significance. The significance of an impact is a direct combination of:

- The probability of occurrence;
- The magnitude of change (spatial and temporal);
- The value and sensitivity of the receptor or receiving environment.

The probability of an event occurring is determined by professional judgement, based on past experience of similar projects and environments. There are four grades of probability as indicated below:

- 0-25% (Low);
- 26-50% (Med);
- 51-75% (High);
- 76-100% (Very High).

The value/sensitivity of an ecological receptor is a more difficult parameter to assess because it depends on a number of interacting things, including rarity, integrity, biodiversity etc.

In this assessment, four levels of ecological *value* are used in the assessment of ecological impacts. These are defined according to the

- rarity/scarcity of the species/habitat,
- the local, regional, national or international importance of the species or habitat,

- integrity of the habitat – i.e. whether the habitat is intact or fragmented,
- whether the habitat is in good condition or is damaged, e.g. from things such as weed invasion, overgrazing, vandalism, pollution or fly tipping
- whether the habitat is a good example of its type, with appropriate biodiversity and indicator species

Indicative definitions of *ecological* value used in this assessment are as follows:

Low. Common species and habitats found throughout the UK. Areas of land which have no nature conservation protection or designation. Habitats which are degraded in some way, through overgrazing, weed invasion, pollution, etc. Habitats which are not intact or have been fragmented. Common habitats which are species poor.

Medium. Species and habitats which are common but are of at least local importance. Areas which have local protection, perhaps as Local Nature Reserves. Habitats which have perhaps been degraded but show some potential for restoration. Species and Habitats which are listed in Local Biodiversity Action Plans.

High. Species and habitats which are declining in numbers and extent and are of regional or national importance. Areas which have at least regional or national protection/designation, such as SSSI or NNR status. Sites containing at least one Species or Habitat which is listed in Local and UK Biodiversity Action Plans. Sites containing at least one Species listed in Schedules 1, 5, and 8 or the Wildlife and Countryside Act (1981) as amended, in the UK Biodiversity Action Plan, the EU Habitats Directive and UK Red Data Books. Habitats which are intact and in good condition.

Very High. Species and habitats which are rare or declining in numbers or extent and are of national or international importance. Areas which have national or international protection/designation, such as SACs, SPAs, Ramsar sites etc. Sites with more than one Species and/or Habitat which is listed in Schedules 1, 5, and 8 or the Wildlife and Countryside Act (1981) as amended, the UK Biodiversity Action Plans and the EU Habitats Directive. Species listed in UK Red Data Books. Habitats which are intact, in good condition and provide good examples of their type in the UK.

Using the above probability grades together with *value* and/or sensitivity of the receptor, the degree of significance of a negative impact is determined from the Impact Assessment Matrix given below.

Impact Assessment Matrix

Probability	Value and Sensitivity of Receptor			
	Low	Medium	High	Very High
Low (0-25%)	Negligible	Minor	Moderate	Moderate
Medium (26-50%)	Negligible	Minor	Moderate	Major
High (51-75%)	Minor	Minor	Moderate	Major
Very High (76-100%)	Minor	Moderate	Moderate	Major

Positive consequences are identified, but not rated. All positive consequences are identified as opportunities for project enhancement, to provide added value to the outcomes of the project.

The rating of the impact is the most important step in the EclA process since it is this rating, which is used to assess whether mitigation is required and also to determine whether mitigation measures have reduced the impact to an acceptable *Residual Impact Rating*. In the environmental impact assessment, impacts rated as negligible or minor are considered to be acceptable. The aim of mitigation measures described in this report is to reduce all identified impacts to a rating of minor or lower.

11.7.2 Recommending Mitigation Measures

Once the impacts have been evaluated and their significance determined, mitigation measures are proposed which are designed to prevent and minimise all effects. There are several potential types of mitigation:

- *Prevention:* avoid, relocate, modify the design, do not carry out the development.
- *Minimisation:* modify location, modify design, alter technology adopted, reduce the scale of the development etc.
- *Compensation:* provide replacement elements for any lost (eg. Open green spaces, road network, public facilities, enhancement of wildlife and nature conservation elements and habitat creation, etc.

The optimum order of implementation of mitigation is prevention first, then minimisation and only as a final measure, compensation. The aim in all mitigation proposals is to reduce any adverse impacts to acceptable levels. Thus, the final step in the EclA is the assessment of residual ecological impacts after the implementation of proposed mitigation measures. In this assessment, residual impacts assessed as minor or negligible are considered to be acceptable for the project.

11.7.3 EclA for Parrys Quarry

The EclA for Parry's Quarry landfill is based on the information that part of the site is planned for landfill while, in the short term, the remainder will continue to be quarried. The programme of development of the site is provided in Chapter 2 of this Environmental Statement. The assessment is carried out for all three stages of the proposed development: construction of the landfill cells and access road, operation of the landfill site and restoration of the ground surface after operations have been completed. Potential impacts are identified below for each phase and assessment of their significance, together with proposed mitigation measures and a re-assessment of residual impacts, is provided in Tables 11.1 parts a-d of Appendix 11.5, with descriptions provided in the following sections of this report.

11.7.4 Assessment of Potential Impacts

(b) Potential Impacts During the Construction Phase.

Impacts during the construction phase of the development of the site may result from the building of access roads and construction of hard standings and infrastructure related to the development of the landfill site. This will involve earth movements, installation of drainage, the lay down of construction materials and vehicle movements. Impacts associated with such activities are likely to be temporary and of a less serious nature than the longer-term impacts of the development. They may include risks such as disturbance to local birds and other animals using the site at this time due to noise generated by vehicles and plant construction activities or may come from pollution incidents or similar. There is potential for soil erosion and surface water run-off from the working area into the more sensitive areas of the site. Temporary habitats may also be created during this stage of development which are utilised by individual species. However, due to the fact that the site is currently a working quarry with high levels of disturbance, although the construction phase impacts are of relevance, they are likely to be of a similar magnitude to the current activities. In terms of direct habitat losses, these will be restricted to the bare and heavily disturbed areas within the central zone of the quarry, and the pits and lagoons created by a previous extraction void, which are proposed for landfill.

Six types of potential ecological impacts have been identified during the construction phase. These are listed below and numbered as C1-C6 in Table 11.1a (Appendix 11.5).

- Disturbance to breeding birds due to noise
- Possible injury to badgers which might stray onto the site
- Soil erosion and runoff from construction of the access road could damage the GCN fencing and SSSI integrity, including pond and terrestrial habitat for GCN
- Fuel or chemical spillages could contaminate pond and terrestrial habitat for amphibians

- Drainage and emptying of existing lagoons could injure or kill any amphibians (especially GCN) if they are present
- Dust generation during construction and earthworks could contaminate water and vegetation in the SSSI, rendering pond and terrestrial habitat unsuitable for newts.

Each of the above is described in more detail below.

C1. Disturbance to breeding birds due to noise and tree removal

Parry's Quarry is already a disturbed location with respect to noise, carrying out quarrying and waste transfer activities. Despite this, there will be the need to create an enhanced site entrance along Pinfold Lane from the junction with the A494. This will require the removal of a limited number of existing mature trees which currently provide limited habitat for common breeding birds. Although the site is of undoubted high local importance to a typically common range of breeding species, including two Red List and four Amber List species of high and medium conservation concern respectively, these species are unlikely to be breeding within the impacted zones due to the lack of suitable habitat. Suitable breeding habitat is restricted to the areas of scrub and woodland along the perimeters of the site and a band of trees and scrub to the centre which, in the majority, will remain unaffected. In addition, the level of disturbance created by the development in the long term is unlikely to deter breeding species, given their tolerance to the current high level of disturbance on the site. Although there may be some disturbance during the construction phase of the development, this is unlikely to exceed the current levels of disturbance generated by quarrying activities.

Tree removal and additional site noise during construction of the landfill cells and access road has the potential to disturb common breeding birds should these activities take place during the bird breeding season (March to October inclusive). This impact has a medium to high probability of occurring and is direct. Since tree removal is very limited in scale and of short duration, and the quarry is already a disturbed noisy working environment with respect to noise, the significance of this impact is considered to be ***minor***.

C2. Possible injury to badgers which might stray onto the site

Since a single badger was seen on site, even if there is no sett present on site, there is a potential for an animal to stray across the site. No severance of territory is envisaged, as it is highly unlikely that badgers will be entering or crossing the main section of the quarry. Likewise, the direct risk to badger by injury or mortality from vehicular movements as part of the development is considered to be very small, given that badger are unlikely to be present within the main body of the site, and that their movements are largely nocturnal. In summary, there is the potential, though remote, of a badger being injured if it should stray onto site. While the impact is direct, the likelihood of it occurring is very low and hence the significance of this impact is considered to be ***negligible***.

C3. Soil erosion and runoff from the access road could damage the GCN fencing and SSSI integrity, including pond and terrestrial habitat for GCN

The construction of the new access road and other cell construction activities have the potential to cause soil erosion and surface runoff which could damage the integrity of the existing great crested newt fence which surrounds the SSSI. There is potential for damage to both terrestrial and pond habitat within the SSSI, through flooding, erosion or through deposition of sediment, rendering terrestrial or pond habitat unsuitable for amphibians, including GCN. These types of impacts in the SSSI are indirect. The likelihood of the impact occurring is low to medium. Since the road will be used throughout the fifteen year life of the project, the impact could recur, hence the impact could be a long term effect. The significance of this impact is thus considered to be ***moderate***.

C4. Fuel or chemical spillages could contaminate pond and terrestrial habitat for amphibians

There is always the potential on any construction or operational site which uses heavy plant, for fuel spillages to occur. Although remote, there is the possibility that fuel spillages could impinge on the SSSI and contaminate terrestrial or pond habitat, rendering them unsuitable for amphibians, including GCN. If it did occur, this impact would be direct and of medium to long term duration. The likelihood of occurrence, however, is very low. Since the value of the receiving environment is high, the significance of this impact is considered to be ***minor to moderate***, depending on the scale of the spillage.

C5. Drainage and emptying of existing lagoons could injure or kill any amphibians (especially GCN) if they are present

Three large lagoons are located within the quarry area, two of which will be infilled as part of the development. These lagoons were excluded from the great crested newt survey on the grounds of health and safety (see Appendix 11.3). The lagoons are not considered to represent suitable great crested newt breeding habitat. Despite this, care needs to be taken when they are drained to ensure that works comply with legislation which requires that no amphibians are killed or injured by the works. The likelihood of an impact occurring is low since the habitat is not considered to be suitable for amphibians. However, if it did occur, it would be direct and irreversible. Since the receiving animals are of potentially high value, the significance of the impact is this considered to be ***moderate***.

C6. Dust generation could contaminate water and vegetation in the SSSI, rendering pond and terrestrial habitat unsuitable for newts.

There is the potential during dry weather conditions for dust to be generated whenever heavy plant is being operated on site. This could apply to any construction or earthmoving activity. During dry and windy conditions, there is the potential for dust to

contaminate both vegetation and the water in ponds of the SSSI, rendering pond habitat in particular unsuitable for amphibians, including GCN. The likelihood of this impact occurring is medium to high. The effects are likely to be direct and of medium term duration. Since the value of the receiving habitat is high, the significance of this impact is considered to be **moderate to major**.

(c) Potential Impacts During the Operational Phase

As the majority of the site is currently heavily disturbed as a result of the existing quarry activities, and provides unsuitable habitat for badgers, reptiles and great crested newts, site operation activities are unlikely to compromise the continuing presence of the identified species on the site. The impacts of the development during the operational phase are mainly associated with the loss, fragmentation or modification of habitats currently found on or around the site, disturbance from vehicles and landfill activities, and possible disturbance, injury or death of protected species due to the presence of vermin such as seagulls, corvids and rats. The boundary mature trees and scrub will be retained, and the mitigation measures proposed as part of this assessment will aim to ensure good management of the landfill site and to enhance the quality of the SSSI habitat to protect the existing population of great crested newt.

Four ecological impacts have been identified during the operational phase of the site. These potential impacts are identified below and are numbered as O1-O4 in Table 11.1b (Appendix 11.5).

- Dust generation and the potential contamination of pond and terrestrial habitat within the SSSI
- Soil erosion and runoff from the access road could damage the GCN fencing and SSSI integrity, including pond and terrestrial habitat for GCN
- Injury to a badger should it stray onto the site
- Disturbance or injury to wildlife due to vermin associates with landfilling operations

The first three of these impacts are similar to those described for the construction phase of the project.

O1. Dust generation and the potential contamination of pond and terrestrial habitat within the SSSI

The operation of waste dump trucks and compactors on the landfill site are likely to generate dust during dry weather. During windy weather there is the potential for dust and loose waste to be blown into the SSSI. This could damage the quality of the terrestrial and pond habitat within the nature reserve, possibly rendering them unsuitable for great crested newts. This impact would be indirect. The likelihood of the impact occurring is low to medium. Since the value of the receiving habitat is high, the significance of this impact is considered to be **moderate**.

O2. Runoff water from the access road could flood and erode the GCN fence surrounding the SSS.

During heavy rainstorms, there is the potential for road runoff water to damage the integrity of the GCN fence surrounding the SSSI and could cause flooding, erosion and sediment deposition. The likelihood of this even occurring is low since appropriate drainage will be built into the road design at the construction stage to ensure that all runoff is routed away from the SSSI to the balancing pond in the north of the site. However, there could always be runoff from an excessively high rainstorm which could have a potentially direct effect on the amphibian fencing surrounding the SSSI. If the fence was compromised by such an event, such that the SSSI was damaged, the significance of this potential impact is considered to be ***moderate to major***.

O3. Injury to a badger should it stray onto the site

There will be increased vehicle use of the site as wagons regularly deliver and dump waste/. There will therefore be the continuing potential for injury to a badger should it stray onto the site. Such an impact would be direct. The likelihood of this impact occurring is low. The significance of this potential impact is considered to be ***negligible***.

O4. Disturbance or injury to wildlife due to vermin or litter associated with landfilling operations

There could be an increased use of the site by seagulls, corvids and rats if landfilling operations are not managed properly. Seagulls, corvids and rats could harm wildlife, particularly amphibians and possibly also small mammals and birds, particularly during the breeding season. The likelihood of this impact occurring is considered to be medium to high. Since the SSSI/SAC is immediately adjacent to the proposed landfill site and specifically designated to protect amphibians, such a direct and adverse effect would be of ***moderate to major*** significance.

There could be windblown and dispersed litter, resulting in smothering of habitats in the SSSI/SAC, both ponds and terrestrial vegetation. Since the SSSI/SAC is immediately adjacent to the proposed landfill site and specifically designated to protect amphibians, such a direct and adverse effect would be of ***moderate to major*** significance.

(d) Potential Impacts During Land Restoration

No further adverse ecological impacts, other than those identified during the operation phase of the landfill site, have been identified during the land restoration phase. The main ecological impact as a result of land restoration will be positive and relate to the reinstatement of open grassland with some areas of native woodland planting on the site.

(e) Mitigation Measures During the Construction Phase

This section of the Ecological Assessment considers the mitigation requirements necessary to address the identified ecological impacts. These are related to both advance mitigation requirements to ensure species-protection prior to any construction work beginning as well as long-term mitigation with respect to the restoration of disturbed habitats.

The guiding principle for mitigation must be the provision of adequate protection for any impacted species and the full restoration of impacted habitats following construction/operation of the landfill to enable no long-term adverse impact on the ecology of the site itself and the SSSI. Wherever possible, opportunities have been sought to enhance the habitats present on site, particularly those within the SSSI and appropriate measure included in the proposed mitigation.

Of particular importance is the risk of temporary disturbance to those species recorded on the site that are legally protected from potentially damaging activities, such as badgers and great crested newts. The mitigation strategies described in the following sections are designed to ensure that the construction workforce take appropriate precautions to minimise such risks and impacts. Likewise, the mitigation plan is designed to identify where appropriate licences are required to carry out both ground investigation work and construction activities which may inadvertently disturb these species

As well as a programme of standard mitigation measures for the construction activities, which include the operation of a programme of environmentally sound working practices, including strict adherence to pollution prevention guidelines (see Chapter 2 of this Environmental Statement), the proposed mitigation measures for each of the above ecological impacts are described in the following sections. Six potential ecological impacts were identified during the construction phase of the site. The proposed actions to mitigate these impacts are described below and summarised in Table 11.1b. This section also includes additional mitigation works specifically designed to enhance the value of the site for great crested newts.

C1. Disturbance to breeding birds due to noise and tree removal

The semi-mature boundaries around the site will be retained wherever possible. If breeding bird habitat is to be removed, it is important to ensure that the legislation is complied with. Legal protection extends to all nesting birds, and it is vital that no nesting species are disturbed during the construction phase of the development, particularly with regard to the areas of scrub or trees, which should be removed outside the breeding season (mid-March until early July). Parrys Quarry is already a noisy location, carrying out quarrying and waste transfer activities. The need to create an enhanced site entrance will require the removal of a limited number of existing mature trees. This, together with additional site noise during construction of the landfill cells and access road, has the potential to disturb common breeding birds. To prevent this, the new site

entrance will be constructed outside of the bird breeding season (March to July inclusive). If works must unavoidably take place at this time, all trees within 20m of this location will be inspected for nests immediately prior to any activity taking place. If any nests are found, all activities will cease in this part of the site until the young have fledged and left the nest. To enhance existing breeding habitat around the boundaries of the site, additional measures will be included, e.g. installing bird boxes and by planting berry bearing shrubs and trees which will provide a food source for wintering birds.

C2. Possible injury to badgers which might stray onto the site

Although there is no badger sett present on site, there is possible that a badger could stray onto the site. It is thus possible that a badger could be injured if it should stray onto site. All mature scrub and tree boundaries around the site will be retained. To reduce even further the possibility of injury, there will be no night time working or vehicle movements on site and there will be a minimum speed limit of 10mph imposed on all vehicle movements on site. In addition, signage on site will indicate the possible presence on site of badgers and hence the need to be observant and to look out for stray animals.

C3. Soil erosion and runoff from the access road could damage the GCN fencing and SSSI integrity, including pond and terrestrial habitat for GCN

Construction activities could cause soil erosion and surface runoff which could damage the integrity of the existing great crested newt fence which surrounds the SSSI and hence could adversely alter both terrestrial and pond habitat for GCN. There will be drainage channels constructed alongside either side of the access track which surrounds the landfill. All appropriate drainage for the landfill and access road will be inserted as a first step in the construction programme. The road camber and design of the drainage scheme will be such that all road surface runoff will be channelled away from the nature reserve towards the balancing pond in the north west of the site. In addition, the road embankment adjacent to the nature reserve will be planted with a mixture of grassland and native trees and shrubs. As well as screening the landfilling operations, the purpose of the planting will be to stabilise the slope and to prevent surface runoff and soil erosion. Prior to the start of any construction works on site, the integrity of the existing GCN fence will be carefully inspected and any breaches made good. At this stage, the GCN fence will be extended to delimit and securely enclose the entire area of the new proposed SSSI extension.

C4. Fuel or chemical spillages could contaminate pond and terrestrial habitat for amphibians

To prevent any fuel or chemical spillages, all fuel and chemical storage on site will be under EA approved conditions, in a single designated area with appropriate containment and bunding. Re-fuelling will only occur in a single designated location with the appropriate drip trays, spill kits and containment.

C5. Drainage and emptying of existing lagoons could injure or kill any amphibians (especially GCN) if they are present

Two of the three lagoons within the quarry will be infilled as part of the development. Although the lagoons are not considered to represent suitable great crested newt breeding habitat, care needs to be taken when they are drained to ensure that works comply with legislation which requires that no amphibians are killed or injured by the works. To ensure that these works are carried out competently, a suitably qualified and licensed ecologist will supervise the works so that if any great crested newts are found they can be appropriately translocated to the habitat within the SSSI in the south of the site. The pumping out of water from the two lagoons will be carried out slowly over a two to three week dewatering period to cause as little turbulent disturbance to waters and substrates as possible. A filter will be fitted over the pump to ensure that no amphibians are accidentally killed or injured by the drainage process. Ideally, the lagoons should be de-watered during the winter period when great crested newts will be in their terrestrial over-wintering phase and not in their breeding ponds.

C6. Dust generation could contaminate water and vegetation in the SSSI, rendering pond and terrestrial habitat unsuitable for newts.

There is the potential during dry and windy weather for dust to contaminate both vegetation and pond waters within the SSSI, rendering pond habitat in particular unsuitable for amphibians, including GCN. Water sprays will be used to dampen earth surfaces during dry conditions and to prevent dust generation during earthworks. Shrub and tree planting along the embankment of the access road adjacent to the SSSI will act as a secondary buffer to screen out any airborne dust and prevent it from reaching the SSSI.

Further Specific Mitigation for Amphibians

There will be no direct loss of confirmed breeding ponds as a result of the development nor will there be losses of suitable terrestrial habitat for great crested newt as there is no suitable terrestrial habitat present within the main impacted section of the quarry.

Although the SSSI ponds are excluded from the quarry by permanent newt exclusion fencing, the fencing does not completely contain the SSSI, and there is therefore a small risk that great crested newts could be present within the construction area at the time of construction works, or that great crested newt could enter the construction area whilst construction works are ongoing. It is also important to ensure that the fencing is not damaged by construction activities, as this may allow great crested newt to enter the working area. In addition, it is known that great crested newt are present within the wider local area, and may therefore have entered the site in the intervening period since the exclusion fencing was erected. Under the relevant legislation (see Section 11.2.3 above), it is an offence to knowingly kill, harm or injure a great crested newt. It is thus necessary to make reasonable efforts to ensure that there are no newts present within

the construction area prior to construction starting and to ensure that there is no opportunity for re-entry to the construction area during construction activities.

Given the confirmed presence of great crested newt within the two ponds in the SSSI and one pond in the wider area, a CCW licence will be required for this project.

Whilst full mitigation measures will be developed as part of the licensing process, the likely mitigation measures will include the erection of permanent amphibian exclusion fencing around the whole site, to include two newt grids located (a) across the road at the site entrance and (b) across the access track to the north of the existing SSSI/SAC. A capture programme will be required within the working area to make reasonable effort to ensure that no amphibians are left within it prior to construction activities commencing. Any amphibians discovered within the exclusion fencing will be translocated by an appropriately licensed ecologist into the SSSI/SAC. The details of the protection measures, fencing and capture programme will be finalised at the time of the license application. The mitigation strategy will also involve measures to enhance the habitat for amphibians in the longer term (see below).

Prior to the start of any construction works, the existing permanent exclusion fencing at the SSSI will be carefully checked to ensure that it is intact, and fit for purpose to reduce the likelihood of great crested newt entering the site during either the construction or operational phases of the development. Should any repairs be required, these will be completed prior to the commencement of construction. During both construction and operation of the site, all personnel working within close proximity to the SSSI will be briefed to ensure that the fence is not damaged during either construction or operational activities and to report to the site manager any observed breaches when they occur. All breaches will be repaired immediately. Once operation of the landfill is ongoing the permanent exclusion fence around the SSSI/SAC will be regularly inspected and maintained throughout the operational period.

Habitat Enhancement for Amphibians

A number of opportunities have been identified to enhance the value of the site for wildlife. These measures relate specifically to improving the existing SSSI/SAC area for amphibians, particularly great crested newt. A number of measures will form an Ecological Management Plan for the reserve. The EMP will be designed to guarantee the quality of the designated area for great crested newts throughout the life of the proposed landfill development. The full detail and scheduling of the EMP is not described in this document, but the main elements are described below.

(a) SSSI Extension

A number of measures are proposed which are designed to extend the area of the SSSI/SAC within the Parry's Quarry site and to enhance both terrestrial and pond habitat within the SSSI/SAC. The aim of these measures is to protect the existing population of great crested newt and ensure its future viability:

The SSSI/SAC will be extended to the north and west to incorporate an area of woodland and grassland which will provide a continuous terrestrial link to the migration corridor provided by the dismantled railway line which runs along the western boundary of the site (see Figure 11.4). The area of woodland and the new grassland/pond areas will be segregated from the quarry by an extension to the permanent amphibian exclusion fencing (as marked in Figure 11.4). It would also be beneficial to extend the permanent exclusion fencing along the quarry (western) boundary of the former railway line.

(b) Pond management

The two extant ponds (Ponds 1 and 2) should be cleared of greater reedmace (*Typha latifolia*) which has been vigorously colonising both ponds and hence reducing their capacity to hold water. The result has been their deterioration as a viable amphibian breeding habitat.

© New pond marginal planting

With regard to plantings, the two ponds currently present within the SSSI have little in the way of suitable egg-laying material, with current aquatic vegetation limited to broad-leaved pondweed and ornamental lilies. Once these ponds have been cleared of Typha, the margins will be replanted with suitable egg-laying plant species, including water forget-me-not (*Myosotis scorpiodes*) and floating sweet-grass (*Glyceria fluitans*).

(f) New pond creation

Ideally a new pond should be created within the SSSI/SAC of sufficient size and using impermeable lining to ensure that the pond does not dry out.

In addition, it is proposed that two new ponds will be created within the proposed SSSI/SAC extension to the north west.

New ponds in both the existing SSSI/SAC and the extended area would be located in open terrestrial grassland habitat, with marginal planting as described above. Surrounding areas within the new SSSI/SAC extension will be sown with a locally sourced wildflower meadow seed mix to create a semi-natural grass habitat which would include a good range of common wild flowers such as meadow buttercup (*Ranunculus acris*), ox eye daisy (*Leucanthemum vulgare*), common knapweed (*Centaurea nigra*), common vetch (*Vicia sativa*), and self heal (*Prunella vulgaris*), with damper species present in areas around ponds (eg red campion (*Silene dioica*), meadow sweet (*Filipendula ulmaria*) ragged robin (*Lychnis flos-cuculi*), purple loostripe (*Lythrum salicaria*) and devil's bit scabious (*Succisa pratensis*).

(g) Future management of the SSSI

During the operational life of the landfill site it is imperative that the GCN exclusion fence is inspected regularly, ideally quarterly, to confirm its integrity and suitability for purpose. This inspection will be written into the Environmental Management Plan for the site. Should any damage or breaches be discovered, there will be a requirement for these to be repaired immediately.

Both terrestrial and pond habitats within both the existing SSSI/SAC and the proposed new extension require regular management to prevent them from becoming weedy and rank. There should be regular and rotational late season mowing of selected areas of the grassland within both parts of the SSSI/SAC. Since the reserve is relatively small in size, this can be achieved manually, using, eg, a petrol-driven strimmer. The aim should be to strim approximately 30% of the grassland annually, after all wildflowers have set seed and to retain mowings on site, but distant from either pond. A rotational mowing plan should be drawn up before the first mowing activities commence to ensure that the entire area of the site is mown every three years.

The pond habitats should be inspected annually to determine their condition. Ponds should ideally be kept free from invasive macrophytes such as Typha and Phragmites and marginal plants such as water forget-me-not, sweet floating grass, water mint and marsh marigold should be encouraged. Annual inspections should inform a pond management plan. The management plan may require selective and rotational clearing of in-pond vegetation to ensure that appropriate marginal plants for amphibians and GCN egg laying are encouraged. Periodically it is likely that excess leaf litter and sediments may need to be excavated from the ponds so that they do not become infilled and dry out. Both vegetation and sediment/litter removal activities should take place in winter months (October to February) when newts are hibernating and there is no risk of damaging animals while they are in the ponds.

To ensure the long term maintenance of the SSSI in a condition suitable for great crested newts and other amphibians, it is proposed that North East Wales Wildlife (NEWW), formerly Deeside Urban Wildlife Trust, be invited to take over the management of the SSSI/SAC, including the new extension with woodland and ponds. Both terrestrial and pond habitat within the SSSI have deteriorated significantly since their creation in 2001, simply due to a lack of active management. They have thus become significantly less suitable for great crested newts. A number of options are available to achieve the goal of regular appropriate ecological management of this part of the site. For the existing SSSI/SAC, the owner/operator of the site could (a) sign a Section 15 agreement with CCW in relation to the existing SSSI/SAC and (b) engage NEWW to carry out appropriate management, with them possibly applying for Landfill Tax Credits to assist with funding the management of the reserve. For the proposed new extension to the SSSI/SAC, the owner/operator managers of the site would (a) provide an annual commuted sum to support the implementation of the Ecological Management Plan for both the existing SSSI/SAC and the proposed extension, (b) engage NEWW to carry out appropriate management over an agreed period of time, likely to be 21 years, or at least

the lifetime of the landfill project. This could form the basis of a Section 106 agreement with Flintshire County Council.

Other areas of Parry's Quarry site

In accordance with the recommendations for the other protected species, the semi-mature areas of woodland around the boundaries of the site will be retained wherever possible as they provide suitable terrestrial habitat for amphibians, small mammals and common nesting birds. The exclusion newt fencing for the site will therefore be required to be positioned internal to these boundaries to prevent amphibians using these habitats to stray into the working area. The overall mitigation approach to be adopted in relation to great crested newts will be finalised in consultation with CCW prior to formalising these by means of a licence application to the National Assembly for Wales.

11.7.6 Mitigation Measures During the Operational Phase

This section of the Ecological Assessment considers the mitigation requirements necessary to address the identified ecological impacts during the landfilling operations.

Four ecological impacts were identified during the operational phase of the site. The proposed actions to mitigate these impacts are described below and summarised in Table 11.1d (Appendix 11.5).

01. Dust generation and the potential contamination of pond and terrestrial habitat within the SSSI

The operation of waste dump trucks and compactors on the landfill site are likely to generate dust during dry weather. Mist bars will be used routinely during landfilling operations to suppress dispersal of particulates. All areas of access track will be properly cleaned and maintained so that there is no mud or waste which can cause dust. The growth of planted native shrubs and trees alongside the access road will act to filter out any atmospheric dust and prevent its propagation as far as the Nature Reserve. It is considered that after implementation of these mitigation measures, any residual impacts of dust generation will be reduced to a level of minor and hence will be acceptable for the development.

02. Runoff water from the access road could flood and erode the GCN fence surrounding the SSS.

During excessively heavy rainstorms, there is the potential for road runoff water to damage the integrity of the GCN fence surrounding the SSSI and could cause flooding, erosion and sediment deposition. The likelihood of this occurring is low since appropriate drainage will have been built into the road design at the construction stage to ensure that all surface runoff is drained away from the SSSI and routed to the balancing pond in the north west of the site. To ensure that the GCN fence around the SSSI is in good condition, intact and fit for purpose at all times, will be regularly

inspected during the operational period. It is considered that after implementation of these mitigation measures, any residual impact of runoff and soil erosion will be reduced to a level of minor to negligible and hence will be acceptable for the development.

03. Injury to a badger should it stray onto the site

There will be increased and regular vehicle use of the site as wagons regularly deliver waste. There will therefore be the continuing potential for injury to a badger should it stray onto the site. The measures introduced during the construction phase will be maintained throughout operational activities. Namely: (a) a site speed limit of 10mph for all vehicles, (b) no night time vehicle movements and (c) signage at the site entrance to make drivers aware of the possible presence of badgers and the need to take care. It is considered that after implementation of these mitigation measures, any residual impact on badgers will be reduced to a level of negligible and hence will be acceptable for the development.

04. Disturbance or injury to wildlife due to vermin or litter associated with landfilling operations

There could be an increased use of the site by seagulls, corvids and rats if landfilling operations are not managed properly. The site will be rigorously managed to the required regulatory standards. The appropriate Regulation is provided in Landfill Directive Regulatory Guidance Note 5 – Habitats Directive and in Landfill Technical Guidance Note Appendix 6 – Waste Management. Appropriate management measures will involve the daily use of bird control, such as bird scarers or the use of falcons to prevent gulls or corvids from becoming habituated to the site. There is also the possibility of using netting or overhead lines to prevent birds from settling. For control of rats, good site and landfill management will involve daily covering of all waste by spoil (see Section 2.3) to ensure that no decomposing and putrescible waste is exposed to cause attractive odours. Regular inspections which will be part of the site's environmental management plan, will assess how effective these vermin control measures are and will vary preventative techniques according to need and geographical location. It is considered that after implementation of these mitigation measures, any residual impacts due to the presence of vermin on protected species will be reduced to a level of negligible to minor and hence will be acceptable for the development.

Litter management will be effected through use of good site housekeeping, catch drift netting and through regular site inspections and litter cleanup campaigns. Assuming that these activities are implemented, any residual impacts due to the presence of litter on the SSSI/SAC, protected species will be reduced to a level of negligible and hence will be acceptable for the development.

11.7.6 Long-term Site Reinstatement

As the development is for a new landfill in part of the quarry while other parts of the quarry will continue to be worked initially but later converted to landfill, the development

will have a finite lifespan. Landfilling operations are planned to be phased over a period of approximately 15-20 years. The proposed final landfill form is described in Chapter 2 of this ES and presented in Appendix 2.3. The topographic surface of this landform is a rounded mound, designed to shed surface water efficiently. The visual appearance of the final landform has been assessed in Chapter 6 of this ES, based on the long-term reinstatement of the land post-operation as open green space, surrounded by native British woodland plantings, with native shrubs and wildflower meadow (see Chapter 2). The proposed areas of tree plantings and grassland meadow are illustrated in Figure 6.7, with species prescriptions tabulated in Appendix 11.4.

It is anticipated that reinstatement of the site will be of significant benefit to wildlife, for several reasons. Firstly, immediately after the reinstatement of the site, the GCN exclusion fencing around the SSSI could be removed, permitting newt migration into the previously excluded area of the site. While the former landfill site itself would not be an appropriate location for creation of GCN breeding ponds, the surrounding woodland plantings will provide excellent terrestrial GCN habitat for newts using ponds within the extended SSSI as well as newts in the wider local area. Secondly, the opening up of the reinstated site will permit its use in the longer term by a number of species such as badger, possibly brown hare and possibly ground nesting birds such as lapwing and skylark. Thirdly, the planting up of the site peripheries with native berried shrubs and native tree species will provide, in the medium term, suitable refuge, forage and breeding habitat for common breeding birds such as those currently seen on site (wren, blackcap, chaffinch, robin, blackbird, great tit, blue tit, chiffchaff, green woodpecker) and possibly also less common breeding birds such as song thrush and bullfinch.

11.7.7 Assessment of Residual Ecological Impacts

The purpose of an assessment of residual ecological impacts is to determine whether proposed mitigation measures are sufficient to reduce all potential ecological impacts to an acceptable level. In Section 11.8.1 of this EclA it was proposed that a residual impact significance level of minor or less would be considered to be acceptable for this landfill development.

All potential ecological impacts identified during construction and operational phases of the proposed land fill site are considered to be reduced to a residual impact significance level of minor or less (see Tables 11.1c and 11.1d) and therefore are considered to be acceptable for this development.

11.8 Conclusions

This ecological impact assessment (EclA) has used a series of up to date (2006) ecological surveys as a basis for identifying potential ecological impacts associated with the conversion of Parry's Quarry into a landfill site with an operational life of 15-20 years. The assessment considers potential impacts during three stages of the proposed works: construction of the landfill cells and access road, the phased operation of the landfill site and restoration of the land after landfilling operations are complete. .

The Phase 1 Habitat survey of the site confirmed that it contains a variety of different habitats of varying suitability for wildlife. The main habitats considered to be of value for wildlife are the protected Nature Reserve in the south of the site, designated as part of the Buckley Clay Pits and Commons SSSI and part of the Deeside and Buckley Newts Site SAC, comprising open unimproved grassland and pond habitats.

During the 2006 protected species surveys of the site, the presence of breeding great crested newts was confirmed in two ponds located within the SSSI/SAC in the southern part of the site. Signs were identified of badger foraging on site but no badger sett was found within the site. The breeding bird survey found that two BTO Red List species (song thrush and bullfinch) and four Amber List species (willow warbler, dunnock, swallow and green woodpecker) were found on site. The main parts of the site considered to be valuable for breeding birds are the semi-mature deciduous wooded areas which run around the boundaries of the site. While the reptile survey confirmed the potential for the southern part of the site within the SSSI to provide suitable habitat for grass snake, no animals were observed.

The EclA has identified a number of potential ecological impacts during the construction and operational phases of the proposed domestic landfill. During construction, six potential impacts included potentially adverse effects on breeding birds, badgers and great crested newts and their habitat, through activities such as the use of noisy machinery and resultant disturbance, injury to animals by vehicles, runoff drainage and associated soil erosion damaging GCN habitat and the generation and deposition of dust impairing the quality of habitats for GCN. During the landfilling operations, three potentially adverse ecological impacts were identified. These were similar to construction impact: effects of dust generation, surface water runoff causing flooding and erosion and the potential for site traffic to injure a badger if it strayed onto the site.

A range of mitigation measures are proposed for both the construction and operational phases of the development to reduce identified impacts to acceptable levels. These include the erection of temporary amphibian exclusion fencing around the entire site to prevent any great crested newts from straying into the working area. If any great crested newts are found within the site, they will be translocated under license to the SSSI/SAC. There will be robustly designed drainage for both the landfill cell design and the access road, so that all surface water runoff will be routed away from the SSSI towards the balancing pond in the north of the site. Dust suppression measures will be employed during all construction and land filling operations. In addition, shrub and tree planting along the access road between the SSSI/SAC and the proposed landfill will act to entrap atmospheric particulates and prevent their dispersal into the reserve. To prevent injury to any badger which might stray onto the site, a strict vehicle speed limit of 10mph will be imposed on site, there will be no night time working and clear signage will be erected to advise all drivers that they should take care and look out for badgers.

The EclA assessed that once the proposed mitigation measures are implemented, the identified residual ecological impacts during both construction and operational phases of

the landfill would be reduced to acceptable levels. In addition to mitigation measures designed to address specific ecological impacts, opportunities have been sought to enhance the ecological value of existing habitats on site. These measures relate mainly to improving conditions both on site and adjacent to the site for great crested newts. An Ecological Management Plan is proposed to ensure the future active management of the SSSI/SAC.

11.9 References

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12.0 ENVIRONMENTAL MANAGEMENT PLAN

This Environmental Statement has provided a comprehensive assessment of potential environmental impacts related to the proposed project which involves the construction and operation of a solid waste landfill facility at Parry's Quarry, Alltami, Flintshire. In addition to a review of the planning context for the development, six subject areas were assessed in detail. These were:

- Landscape and Visual Impact
- Hydrology and Hydrogeology
- Traffic and Access
- Noise and Vibration
- Air Quality
- Ecology

In this chapter of the Environmental Statement we draw together into an Environmental Management Plan (EMP) for the proposed landfill site at Parry's Quarry all elements of proposed mitigation which have been designed to prevent or minimise adverse impacts in these six subject areas. The EMP is provided in Table 12.1 below. Critical to the implementation of this EMP, the responsible party for each element of the plan is identified together with an indicative timescale for its implementation. The purpose of the tabulation is to provide a single document that can be used to chart progress and compliance of the implementation of the EMP.

There is likely to be a range of different parties involved at different stages of the implementation of the EMP. The site operator will appoint a project manager who will oversee and ensure the implementation of the EMP. This will include overseeing the operations of subcontractors while they are working on site and ensuring that their work is up to the required environmental standards.

The EMP provides a robust system for ensuring the implementation of the proposed mitigation measures required to ensure that there are no significant environmental impacts according to the EIA. Following receipt of planning consent, further detailed design and assessment work will take place and a working plan developed to describe the precise manner in which the site will be operated. These items, together with a number of technical environmental monitoring programmes, will form part of the Integrated Pollution Prevention and Control (IPPC) Permit which will need to be secured by the landfill operator prior to the implementation of the project.

TABLE 12.1 PARRY'S QUARRY ENVIRONMENTAL MANAGEMENT PLAN
(Proposed management activities are ordered according to subject matter, not according to chronology or level of importance)

Subject Area	Identified Impact	Proposed Mitigation Elements	Responsibility for Implementation	Timescale for Implementation
LANDSCAPE AND VISUAL IMPACT	Adverse visual impact for receptors located immediately north of the site	A 4m high screen fence will be erected along the northern boundary to screen the development from the adjoining industrial premises	Site operator	During the construction phase
	Minor adverse visual impact on views from Northop Hall	<ul style="list-style-type: none"> In the phasing the landfill operation, discrete cells will be filled and temporarily grassed to reduce the visual impact of the on-going operation. Final restoration at the earliest opportunity. The first phase of above-grade landfill will provide significant screening of later phases. 	Site operator	Progressively during site operational phase
	Generally minor adverse visual impacts	<ul style="list-style-type: none"> Final landfill form will have shallow 1:20 slopes at the top to create a more naturalised domed landform integrated into the surrounding setting. New tree planting as part of the restoration proposals will integrate the new landform into the surrounding landscape and reflect the wider landscape character 	Site Operator	Sequentially during site operational phase .
HYDROLOGY AND HYDROGEOLOGY	Potential generation of suspended sediments in surface drainage waters as a result of earthmoving and construction activities	<ul style="list-style-type: none"> Diversion of natural drainage around the site and minimisation of water ingress Localised and focussed dewatering to minimise cone of depression to that required for engineering purposes Provision of sumps and ponds to allow settlement of solids prior to discharge 	Earthmoving and Construction sub contractor	During site enabling works, site construction phase and site operational phase
	Potential propagation to groundwater of suspended sediments due to earthmoving and construction activities	<ul style="list-style-type: none"> Diversion of natural drainage around the site and minimisation of water ingress Separation on site of non-impacted and potentially impacted water as much as possible 	Earthmoving and Construction sub contractor	During site enabling works, site construction phase and site operational phase

Subject Area	Identified Impact	Proposed Mitigation Elements	Responsibility for Implementation	Timescale for Implementation
HYDROLOGY AND HYDROGEOLOGY (cont)	Potential contamination of surface drainage waters as a result of spillages of oils and other organic contaminants during earthworks and construction	<ul style="list-style-type: none"> • Proper maintenance of plant • Storage of fuels and chemicals in secure areas with hardstanding and adequate bunding • Management plan and training to enable identification of potential impact whilst plant is operational • Grit traps and oil separators in site drainage and before discharge 	Earthmoving and Construction sub contractor	During site enabling works, site construction phase and site operational phase
	Potential contamination of groundwaters as a result of spillages of oils and other organic contaminants during earthworks and construction	<ul style="list-style-type: none"> • Proper maintenance of plant • Storage of fuels and chemicals in secure areas with hardstanding and adequate bunding • Management plan and training to enable identification of potential impact whilst plant is operational 	Earthmoving and Construction sub contractor	During site enabling works, site construction phase and site operational phase
	Potential contamination of surface waters (Alltarni and Wepre Brooks) with suspended sediments as a result of dewatering.	<ul style="list-style-type: none"> • Provision of sumps and ponds to allow settlement of solids prior to discharge • Provision of storage and water management to control discharge regime during sensitive periods 	Specialist technical subcontractor in collaboration with the Site operator	During both site construction phase and operational phase
	Potential lowering of the groundwater table as a result of dewatering	<ul style="list-style-type: none"> • Localised and focussed dewatering to minimise cone of depression to that required for engineering purposes 	Specialist technical subcontractor in collaboration with the Site operator	During both site construction phase and operational phase

Subject Area	Identified Impact	Proposed Mitigation Elements	Responsibility for Implementation	Timescale for Implementation
HYDROLOGY AND HYDROGEOLOGY (cont)	<p>Potential for landfill leachate to contaminate surface waters (Alltami and Wepre Brooks) and surface water abstractions, to contaminate groundwater and groundwater abstractions or to move via groundwaters to contaminate surface waters indirectly</p>	<ul style="list-style-type: none"> Engineered design in accordance with Landfill Regulations (supported by risk assessment) CQA of construction process Proactive leachate management system Leakage monitoring Interception of any leakage before it can reach the surface water system Appropriate disposal and/or treatment of any contaminated leakages Minimisation of time before capping and restoration of landfill cells to restrict water ingress 	<p>Site operator in collaboration with construction subcontractor and specialist drainage subcontractor</p>	<p>During site operational phase</p>
TRAFFIC AND ACCESS	<p>Potential delays and disruption to network traffic and local businesses and residents due to alterations to the traffic signals on the A494</p>	<ul style="list-style-type: none"> Contractor working at non-peak periods under suitable traffic management and signing Advanced signing will be erected in consultation with the Highway Authority to advise road users of the possible delays No works involving a reduction in road space will take place during the holiday 'embargo' periods Consultation with local residents and businesses will ensure that delay and disruption to these operations are minimised. 	<p>Site operator</p>	<p>During the construction phase</p>
	<p>Potential delays and disruption to network traffic and local residents due to construction of the new site entrance</p>	<ul style="list-style-type: none"> Similar traffic management as outlined above Similar signage as outlined above Implementation of good working practices to minimise dust and dirt. Existing roads will be kept clean at all times Use of plant that is efficient and in good working order 	<p>Site operator</p>	<p>During the construction phase</p>

Subject Area	Identified Impact	Proposed Mitigation Elements	Responsibility for Implementation	Timescale for Implementation
TRAFFIC AND ACCESS (cont)	Potential disruption to network traffic and occupiers of local businesses served by Pinfold Lane due to increased traffic movements associated with landfilling.	<ul style="list-style-type: none"> Implementation of improved junction layout and access off the A494. The construction of the new site access off Pinfold Lane and the improvements to the existing traffic signal controlled junction will ensure that the additional traffic generated by the development will be accommodated without significant impact to network traffic. 	Site operator	During the operation of the landfill
NOISE AND VIBRATION	Noise disturbance to local residences and the Holiday Inn due to (a) the use of earthmoving equipment, (b) construction operations and (c) dewatering pumps	<p>Implementation of a Noise Management Plan agreed in advance with Flintshire County Council. The plan will agree issues such as:</p> <ul style="list-style-type: none"> operation hours scheduling of noisy activities a comprehensive complaints procedure noise control methods 	Site operator	During the construction phase
	Noise disturbance to local residents, businesses and the Holiday Inn due to operation of gas flare, gas engines and increased traffic noise	<ul style="list-style-type: none"> A hard metalled surfaced internal haul road, to minimise vehicle noise Restriction of the vehicle speed along the haul road to avoid body slap from entry lorries Restriction on the operating hours of the site A landfill maintenance programme, with particular attention being given to maintaining improving the noise muffling system on landfill construction and waste/cover soil placement equipment A close board fence about the northern boundary of the site, which should attenuate noise propagation to Ewloe Wood House and the Box. The landfill operator should use the quietest available plant to carry out the task effectively 	Site Operator	During the operational phase

Subject Area	Identified Impact	Proposed Mitigation Elements	Responsibility for Implementation	Timescale for Implementation
NOISE AND VIBRATION (cont.)	(cont.)	<ul style="list-style-type: none"> • The landfill operator should emphasise the need to minimise noise through training of site personnel • The landfill operator should ensure there is a comprehensive compliant procedure • Position an acoustic screen along the southern boundary of the site to minimise noise disturbance at Parry's Cottages. 		
AIR QUALITY	Potential adverse impacts on local residents, nearby office workers and vegetation and sensitive habitats in the SSSI/SAC due to the generation and deposition of dust as a result of earthmoving and construction activities	<ul style="list-style-type: none"> • Implementation of CEMP including various measures to reduce the potential for dust generation and dispersion including: <ul style="list-style-type: none"> ○ Keeping on-site roads and the main road adjacent to the site entrance clean of mud and waste ○ Speed limits of site access road ○ Spraying site access road to damp down and loose particles ○ Locating stockpiles away from sensitive receptors and provision of windbreak netting • On site materials handling in enclosed areas • Implementation of CEMP including measures to reduce impacts associated with vehicle and exhaust related emissions including use of well maintained plant, restricting idling engines and using pre determined routes for construction traffic. 	Site operator	During the construction phase
	Potential adverse impact on local air quality due to vehicle and exhaust emissions associated with the earthworks and construction phases of the development		Site operator	During the construction phase

Subject Area	Identified Impact	Proposed Mitigation Elements	Responsibility for Implementation	Timescale for Implementation
AIR QUALITY (cont)	Potential adverse effects on (a) global warming and ozone depletion and (b) adjacent residential properties and adjacent land users (offices) due to odour, the generation and migration of landfill gas as a result of degradation of landfilled wastes, waste deliveries and handling.	<ul style="list-style-type: none"> • No additional mitigation is considered necessary on the basis that procedures for the operation of landfill sites are defined and outlined within a number of Environment Agency documents. Additional mitigation measures are limited to : <ul style="list-style-type: none"> ○ Management and monitoring of particulates including dust ○ Management and monitoring of odour ○ Stack and engines monitoring and maintenance • Implementation of a landfill gas management plan 	Site operator	During the operational phase
ECOLOGY	Potential disturbance to breeding birds due to noise and tree removal associated with construction of the new site entrance and site access. Possible injury to any badgers which may stray across the site as a result of construction vehicles and heavy plant during earthmoving and construction activities	<ul style="list-style-type: none"> • Works to be carried out outside the breeding season for birds) (i.e. outside of March to July inclusive) 	Construction sub-contractor	During the construction phase
		<ul style="list-style-type: none"> • Site speed limit of 10mph for all vehicles • No night time vehicle movements • Signage at the site entrance to make drivers aware of the problem 	Construction sub-contractor	During the construction and operational phases
	Potential damage to the protected habitats of the SAC/SSSI due to soil erosion as a result of bare earth exposure during earthworks and the use of the site access road	<ul style="list-style-type: none"> • Prior to any construction works commencing, a full structural inspection will be made of the existing GCN fence. Repairs will be made to any damage and new permanent GCN fencing will be built to extend the GCN fence along the entire length of the nature reserve • The embankment of the access road will be planted with grass cover and with shrubs and trees to provide a stabilizing buffer zone between the road and the nature reserve 	Site operator	Elements of the work will be carried out during the construction and operational phases

Subject Area	Identified Impact	Proposed Mitigation Elements	Responsibility for Implementation	Timescale for Implementation
ECOLOGY (cont)	(cont)	<ul style="list-style-type: none"> The access road will be properly designed with integral drainage to ensure that all surface runoff is drained away from the SSSI and routed to the balancing pond in the north west of the site. The GCN fence around the SSSI will be inspected regularly during the operational period to check that it is in good condition, intact and fit for purpose. 		
	Potential contamination of pond and terrestrial habitat due to spillages of fuels or other substances such as concrete.	<ul style="list-style-type: none"> All fuels and chemicals will be properly stored with adequate containment and bunding All refuelling operations will be carried out in a single designated location with appropriate drip trays or other containment In the event of a fuel or chemical spillage, a rapid response programme will be put in place to deal with it rapidly and effectively. Spillage kits will be present on site to ensure fast treatment 	Site operator in collaboration with the construction sub-contractor	During the construction phase
	Potential injury or death of great crested newts or other amphibians during the dewatering of the larger on-site lagoon	<ul style="list-style-type: none"> Prior to the start of any works on site, a temporary GCN fence will be erected around the entire site. A suitably qualified and licensed ecologist will be appointed to supervise the GCN works. If any great crested newts are found they will be translocated to suitable habitat within the SSSI in the south of the site. Pumping out of water from the two lagoons will be carried out slowly over a two to three week dewatering period to cause as little turbulent disturbance to waters and substrates as possible. A filter will be fitted over the pump to ensure that no amphibians are accidentally killed or injured by the drainage process. The lagoons will be de-watered during the winter period 	Site operator	During the construction phase

ECOLOGY (cont)	(cont)			
	<p>Potential tainting and damage to water and vegetation within the SAC/SSSI due to dust deposition associated with earthworking, vehicle movements and construction activities in dry weather.</p>	<ul style="list-style-type: none"> • when great crested newts will be in their terrestrial over-wintering phase and not in their breeding ponds. • Water spraying will prevent dust generation during all earthworking activities • All areas of access track will be properly cleaned and maintained so that there is no mud or waste which can cause dust • The embankment of the access road will be planted with a mixture of native shrubs and trees to provide an effective screening of the SSSI. The tree canopy cover will trap dust and prevent its propagation as far as the Nature reserve. 	Site operator	During the construction and operational phases
	<p>Potential disturbance, injury or death to amphibians, small mammals or birds due to predation by vermin (seagulls and rats) causing. Litter could smother valuable habitats and vegetation.</p>	<ul style="list-style-type: none"> • Good site management – particularly daily covering of waste by soil, ensuring that no putrescible waste is exposed, use of bird scarers, use of netting or overhead lines to prevent birds from settling 	Site operator	During the operational phase
	<p>General adverse impacts on ecology</p>	<ul style="list-style-type: none"> • Habitat restoration and enhancement within the SAC/SSSI • Extension of the current area of SAC/SSSI to include a green corridor along the former railway line to the north west of the site • Creation of new pond and terrestrial habitat for great crested newts and other amphibians • Post-landfill restoration of the site to include significant areas of new tree planting, grassland and wildflower meadow 	Site operator in collaboration with a suitably qualified ecological sub-contractor	During site enabling works, construction works and site operational phase.

13.0 SUMMARY

This Environmental Statement provides a description of a proposed landfill development at Parry's Quarry, Alltami, Flintshire. It outlines the baseline environmental conditions of the site itself and its nearby surroundings. In addition to a review of the planning framework in Flintshire and Wales, this document provides an assessment of the need for a new landfill facility in this location and a full environmental impact assessment (EIA), based on a scoping assessment provided by Flintshire County Council. Six key subject areas were highlighted in that scoping assessment and are addressed in the EIA: landscape and visual impact, hydrology and hydrogeology, traffic and access, noise and vibration, air quality and ecology.

The first part of the Environmental Statement identifies and describes the real and pressing need for landfill void space within Flintshire for both municipal solid waste and non-hazardous commercial and industrial waste. The proposed landfill project at Parry's Quarry will help to meet this need.

Flintshire Council have included the Parry's Quarry site within their Areas of Search for suitable locations for future new waste management facilities within Flintshire and have accepted in principle the potential of the site for landfilling activities.

The results of the EIA have identified a number of potentially adverse impacts, the most notable of which are potential impacts on surface and ground waters, noise disturbance to local receptors and disturbance to the European designated SAC/SSSI in the south of the site which currently harbours a small population of great crested newts. All of these potentially significant impacts can be fully addressed by mitigation measures.

In summary, this Environmental Impact Assessment, based upon a carefully considered design, has demonstrated that the project can be implemented without major adverse environmental effects. The restoration proposals for the site can provide a site at completion of landfilling which is significantly enhanced with respect to ecological value and which could provide a valuable resource as public amenity open space.