5 APPENDICES

5.1 NEED FOR DEVELOPMENT

5.1.1 GOVERNMENT POLICY

The unsustainable levels of resource utilisation and waste generation within the EU have made waste management a central issue for policy makers in the EU (EPA, 2012). Consequently, the EU passed the Waste Framework Directive in 2008. One of the main objectives of the Directive is to provide a framework to transform Europe into a society with high levels of recycling and resource efficiency. The Waste Framework Directive 2008/98/EC established a legal framework for the treatment of waste within the EU, through the prevention of the harmful effects of waste generation, and through waste management. In order to effect this transformation, Member States are required to implement legislation in accordance with a hierarchy for the treatment of waste.

Of particular importance is Article 11.2 of the Directive, which states that "Member States shall take the necessary measures designed to achieve that by 2020 a minimum of 70% (by weight) of non-hazardous construction and demolition waste excluding naturally occurring material defined in category 17 05 04 in the List of Wastes shall be prepared for re-use, recycled or undergo other material recovery (including backfilling operations using waste to substitute other materials)".

The Government's strategy for the construction sector, Construction 2020, sets out a cross-government action plan to help support a sustainable construction sector over the longer term.

The Government has through the National Development Plan and the National Spatial Strategy made clear its objective to facilitate more balanced social and economic growth throughout the State. Such balanced regional growth will result in an increased requirement for social and economic infrastructure with a consequential increase in demand for recovery and re-use of inert Construction and Demolition (C&D) waste.

There are two main documents which underpin the direction of spatial development in the County. Firstly, at a National level the National Spatial Strategy (NSS), and secondly at a Regional level, the Regional Planning Guidelines (RPGs) for the Greater Dublin Area (GDA). Ultimately, the NSS will be replaced by the NPF 2040 (just published), and in the case of County Meath, the RPGs will be replaced by the Regional Spatial & Economic Strategies (RSES) for the Strategic Eastern Planning Area, once released by Eastern and Midland Regional Assembly. The Project Ireland 2040 Plan stipulates that the regional assemblies will complete their respective RSESs by early 2019, and thus the RPGs for the GDA remain in effect.

The economic development of Meath can no longer be viewed in isolation from adjoining counties and regions. Ireland as a country has become an open economy and as a result the economic development of Meath must now be considered in the context of regional, national and global influences.

5.1.1.1 National Context

5.1.1.1.1 National Spatial Strategy 2002-2020

The National Spatial Strategy (NSS) was launched by the government in late 2002 and is designed to provide a framework for balanced social, economic and physical development between the regions for the next 20 years (DoELG, 2002). The strategy is based on a hierarchy of settlement; Gateways, Hubs and County Towns along with the need to support the role of smaller towns, villages and diverse rural economies.

The NSS provides a framework to promote and balanced regional development and sustainable growth. It also guides policies, programmes and investment. The strategy emphasises continued strong growth in the Greater Dublin Area (GDA), but with significant improvement in the regions outside the capital and more particularly in the nine gateway cities and nine hub towns.

Meath occupies a strategic location in the Greater Dublin Area (GDA) and benefits from a wealth of natural resources. As a constituent of the GDA, it is part of the largest market in the country and at the centre of Ireland's primary economic hub. The transport infrastructure in the County provides easy access to Dublin Airport and Port. Meanwhile the presence in Meath of a large number of national roads facilitates access to the remainder of the country. Meath also benefits from a strategic location along the M1 Dublin-Belfast international corridor, the primary economic corridor in Ireland.

The NSS recognises that quality of life is increasingly important to people and that unbalanced development affects quality of life. The growing trend of long distance commuting, and the dislocation between centres of employment and residential development are economically, socially and environmentally unsustainable. The NSS recognises that the solution lies in balanced regional development, whereby the potential of each area to contribute to the economic, social and environmental wellbeing of the State is developed. Ireland's growing population can be accommodated within existing settlements, by renewing and developing our cities, towns and villages, and ensuring that urban land is used sensitively and efficiently in order to provide attractive, sustainable, compact, public transport friendly forms, whilst avoiding urban sprawl.

The Government published the successor to the National Spatial Strategy, known as "Project Ireland 2040" in February 2018. This new overarching public policy initiative consists of the National Planning Framework to 2040 and the National Development Plan 2018-2027, and sets the long term national planning and development aims for the next two decades.

5.1.1.1.2 Infrastructure & Capital Investment Plans

The National Development Plan (NDP) 2007-2013 was revoked in 2010, at the height of the recession, and was succeeded in 2011 by the Infrastructure and Capital Investment Plan 2012-2016 (DoPER, 2011). The Government agreed an exchequer capital programme amounting to €17 billion for the 5-year period 2012-2016. This large exchequer investment was directed at addressing critical infrastructure investment gaps in order to aid economic recovery, social cohesion and environmental sustainability. The sectors prioritised for investment in the Framework include education, health, jobs and enterprise.

The focus of the capital spending is to be on supporting those sectors and projects which will best contribute to sustainable job creation. The review of Infrastructure and Capital Investment 2012-16 (DoPER, 2011) assesses the existing capacity of Ireland's infrastructure and identifies remaining gaps which must be addressed to aid economic recovery, social cohesion and environmental sustainability.

The approach identifies four main components of the investment strategy, namely:

- Economic infrastructure – encompassing transport networks, energy provision and telecommunications capacity.
- Investment in the productive sector and human capital – such as capital investment in education infrastructure.
- Environmental infrastructure – including our waste and water systems.
- Critical social investment – such as the health service and social housing programmes.

In September 2015, the Government launched a second Infrastructure and Capital Investment Plan 2016-2021, whose principal stated goal is "Building on Recovery". With steadily improving public finances, the Government was able to commit to increasing the level of expenditure on capital infrastructure gradually over the programme period, in a way that is sustainable and long term. The plan represents a €42 billion framework for infrastructure investment in Ireland over the period. The plan combines direct investment by the Exchequer of €27 billion, a third phase of PPP investments of about €500 million and State-owned sector investment of around €14.5 billion. In total, this State-backed investment package represents over 3.5 percent of GNP each year between 2016 and 2021, and it will support more than 45,000 construction-related jobs.

The Plan prioritises spending on those areas of greatest need as the economy continues its strong recovery. The considerable improvement in the public finances has allowed the Government to increase the level of expenditure on capital infrastructure gradually over the course of the next six years, in a way that is sustainable and long term in its design and focus. Economic growth is dependent on the capacity to move people and goods around the country quickly and easily, and significant strides had been made since 2000 in improving Ireland's national transport infrastructure. Nonetheless, transport is allocated the largest sectoral share of 29% of the Exchequer Capital Envelope under the Plan. In particular, the national, regional and local road network is allocated €591 million in 2016, progressively increasing to €1,082 million in 2022, and totalling €6 billion over the period of the Plan.

Continuation of the public capital programme will have beneficial effects on the construction industry, and on the wider economy in terms of employment, continued recovery and national competitiveness. As the economy continues to grow and the population increases towards its projected 2020 level of 5,000,000, real planning for the future is vital (Construction Industry Council, (June 2010) Building a Better Ireland). No successor national spatial plan has been adopted, but on February 16th 2018, the government published "Project Ireland 2040", the new draft National Planning Framework to replace the revoked NSS.

5.1.1.1.3 Project Ireland 2040

Project Ireland 2040 is the Government's new overarching public policy initiative, which emphasises "social outcomes and values consistent with prudent economic and budgetary policy" (DoHPLG, 2018). Project Ireland 2040 consists of the National Planning Framework to 2040 and the National Development Plan 2018-2027. These will essentially replace the revoked NSS and the Infrastructure and Capital Investment Plan 2016-2021, respectively. The key difference with all previous spatial planning policies is that it represents an alignment of the investment strategy with the strategic planning policy, to create a unified and coherent plan for the country. Insofar as the Plan is underpinned by investment and placed on a statutory footing that it will receive 'compliance' as opposed to 'due regard', it will have the force of both funds and law.

The objective of Project Ireland 2040 is to provide a "comprehensive social, economic and cultural infrastructure for all our people to flourish". The policy seeks to achieve ten strategic outcomes, building around overarching themes of wellbeing, equality and opportunity. The ten shared priorities will ensure a consistent approach between planning objectives under the National Planning Framework and investment commitments under the National Development Plan. These are:

1. Compact Growth
2. Enhanced Regional Accessibility
3. Strengthened Rural Economies and Communities
4. Sustainable Mobility
5. A Strong Economy, supported by Enterprise, Innovation and Skills
6. High-Quality International Connectivity
7. Enhanced Amenity and Heritage
8. Transition to a Low Carbon and Climate Resilient Society
9. Sustainable Management of Water and other Environmental Resources
10. Access to Quality Childcare, Education and Health Services

5.1.1.1.3.1 National Planning Framework to 2040

The new draft National Planning Framework (NPF) is the Government's high-level strategic plan for shaping the future growth and development of the country. The NPF sets out a spatial strategy for Ireland, to accommodate in a sustainable and balanced fashion, the significant projected changes in demographics, such as a population growing by an extra million, and which is increasingly aging and living in smaller family units. The NPF will guide development and investment over the next two decades and will empower each region to lead in the planning and development of their communities, based on a common set of national objectives and key principles.

The above vision will be achieved by:

- Developing a new region-focused strategy for managing growth;

- Linking the NPF to a new 10-year investment plan, the National Development Plan;
- Using state lands for certain strategic purposes;
- Supporting the NPF with more environmentally focused planning at local level;
- Backing-up the NPF in law with an Independent Office of the Planning Regulator.

Some of the key provisions are as follows:

- A roughly 50:50 distribution of growth between the Eastern and Midland region, the Southern, and the Northern and Western regions, with 75% of the growth outside of Dublin and its suburbs.
- The five cities in terms of population size (pop. > 50,000): Dublin, Cork, Limerick, Galway and Waterford, will be targeted for 50% of overall national growth between them, with Ireland's large and smaller towns, villages and rural areas accommodating the other 50% of growth.
- Major new policy emphasis on renewing and developing existing settlements rather than continual expansion and sprawl of cities and towns into the countryside, with a target of at least 40% of all new housing to be delivered within the existing built-up areas of cities, towns and villages on infill and/or brownfield sites.
- Implementation of the NPF will be fully supported by the Government's investment strategy for public capital investment and investment by the State sector in general, as outlined in the National Development Plan.
- The State owns key parts of our cities and towns, the development of which can play a vital role in reshaping those urban areas, providing homes, places of work and recreation, and a new national Regeneration and Development Agency will be established to harnessing public lands as catalysts to stimulate regeneration and investment.
- The future planning and development of our communities at local level will be refocused to enable a national transition to a competitive low carbon, climate resilient and environmentally sustainable economy by 2050, through harnessing the country's prodigious renewable energy potential.
- More strategic and co-ordinated planning of our cities and large towns across local authority boundaries will be introduced, including statutorily backed Metropolitan Area Strategic Plans in the five cities.
- The NPF will be given full legislative support within the planning system, including regular reviews and updates to reflect changing circumstances as necessary. The legislation underpinning the Framework will create a new independent Office of the Planning Regulator (OPR) to monitor its implementation of the NPF.
- For each of the three regions, the Regional Assemblies will prepare their own strategy in accordance with the framework, and these will be completed by early 2019 and will be known as Regional Spatial and Economic Strategies. County and City Development Plan review cycles will then fall in to line with their respective regional strategies, ensuring that the shared vision is carried through to the local planning level.

The NPF includes 75 National Policy Objectives, of which the following are considered particularly relevant here:

National Policy Objective 1a

The projected level of population and employment growth in the Eastern and Midland Regional Assembly area will be at least matched by that of the Northern and Western and Southern Regional Assembly areas combined.

National Policy Objective 2a

A target of half (50%) of future population and employment growth will be focused in the existing five cities and their suburbs.

National Policy Objective 3a

Deliver at least 40% of all new homes nationally, within the built-up footprint of existing settlements.

National Policy Objective 3b

Deliver at least half (50%) of all new homes that are targeted in the five Cities and suburbs of Dublin, Cork, Limerick, Galway and Waterford, within their existing built-up footprints.

National Policy Objective 3c

Deliver at least 30% of all new homes that are targeted in settlements other than the five Cities and their suburbs, within their existing built-up footprints.

National Policy Objective 4

Ensure the creation of attractive, liveable, well designed, high quality urban places that are home to diverse and integrated communities that enjoy a high quality of life and well-being.

National Policy Objective 5

Develop cities and towns of sufficient scale and quality to compete internationally and to be drivers of national and regional growth, investment and prosperity.

National Policy Objective 6

Regenerate and rejuvenate cities, towns and villages of all types and scale as environmental assets, that can accommodate changing roles and functions, increased residential population and employment activity and enhanced levels of amenity and design quality, in order to sustainably influence and support their surrounding area.

National Policy Objective 12

The Government will establish a National Regeneration and Development Agency to work with local authorities, other public bodies and capital spending departments and agencies to co-ordinate and secure the best use of public lands, investment required within the capital envelopes provided in the National Development Plan and to drive the renewal of strategic areas not being utilised to their full potential. The Government will consider how best to make State lands available to such a body to kick-start its development role and to legislate for enhanced compulsory purchase powers to ensure that the necessary transformation of the places most in need of regeneration can take place more swiftly and effectively.

National Policy Objective 32

To target the delivery of 550,000 additional households to 2040.

National Policy Objective 35

Increase residential density in settlements, through a range of measures including reductions in vacancy, re-use of existing buildings, infill development schemes, area or site-based regeneration and increased building heights.

National Policy Objective 56

Sustainably manage waste generation, invest in different types of waste treatment and support circular economy principles, prioritising prevention, reuse, recycling and recovery, to support a healthy environment, economy and society.

National Policy Objective 75

Ensure that all plans, projects and activities requiring consent arising from the National Planning Framework are subject to the relevant environmental assessment requirements including SEA, EIA and AA as appropriate.

Key future planning and development and place-making policy priorities for the Eastern and Midland Region include:

- Enabling the complementary development of large and county towns in the wider Greater Dublin Area and Midland areas on the key strategic and public transport routes in a regionally co-ordinated manner.
- More effective strategic planning and co-ordination of the future development of nationally and regionally strategic locations at points that straddle boundaries between this and neighbouring regions as in the example of Athlone.
- A focused approach to compact, sequential and sustainable development of the larger urban areas along the Dublin – Belfast economic and transport corridor, along which there are settlements with significant populations such as Dundalk and Drogheda.
- More emphasis on consolidating the development of places that grew rapidly in the past decade or so with large scale commuter driven housing development, with a particular focus on addressing local community and amenity facility provision in many of the larger commuter towns.
- Preparing and implementing a regional priorities programme, to shape and inform delivery of the Regeneration and Development Initiative. It should identify significant ready-to-go city, rural town and village and rural rejuvenation priorities which could harness publicly owned land and other assets that are not being used presently, which together with community and wider private and public sector support and investment, could deliver transformation in an integrated manner.
- Tourism development and promotional branding to ensure that areas like the Midlands and Lakelands areas are developed and promoted in such a way as to play their full part in tapping the economic potential in the region.

- Harnessing the potential of the region in renewable energy terms across the technological spectrum from wind and solar to biomass and, where applicable, wave energy, focusing in particular on the extensive tracts of publicly owned areas of peat extraction in order to enable a managed transition of the economies in such areas.

Building on the progress made in developing an integrated network of greenways, blueways and peatways, that will support the diversification of rural and regional economies and promote more sustainable forms of travel and activity based recreation utilising canals, former railways, and other routes.

As Clashford is located on the periphery of Dublin City and Metropolitan Area (DCMA), and the proposed WRF will primarily serve the construction industry within the DCMA, it is noteworthy that the key future growth enablers for Dublin include:

- Identifying a number of ambitious large-scale regeneration areas for the provision of new housing and employment throughout the city and metropolitan area;
- Progressing the sustainable development of new greenfield areas for housing, especially those on public transport corridors, such as Adamstown, Cherrywood, etc.;
- Determining a limited number of accessible locations for significant people-intensive employment to complement the city-centre and docklands areas;
- Enabling enhanced opportunities for existing communities as development and diversification occurs, particularly through employment, learning and education support;
- Relocating less intensive uses outside the M50 ring in particular and from the existing built-up area generally;
- Delivering the key rail projects set out in the Transport Strategy for the Greater Dublin Area including Metro Link, DART expansion and the Luas green line link to Metro Link;
- The development of an improved bus-based system, with better orbital connectivity and integration with other transport networks;
- Ensuring that water supply and waste-water needs are met by new national projects to enhance the city's and the wider Greater Dublin Area's water supply and increase waste water treatment capacity;
- Improving sustainability in terms of energy, waste and water, to include district heating and water conservation;
- Public realm and urban amenity projects, focused on streets and public spaces, especially in the area between the canals;
- Measures to enhance and better link the existing network of green spaces, including the Phoenix Park and other parks, Dublin Bay and the canals;
- Delivery of the metropolitan cycle network set out in the Greater Dublin Area Cycle Network Plan inclusive of key commuter routes and urban greenways on the canal, river and coastal corridors;
- Improving access to Dublin Airport, to include improved public transport access, connections from the road network from the west and north and in the longer term,

consideration of heavy rail access to facilitate direct services from the national rail network in the context of potential future electrification;

- Facilitating the growth of Dublin Port through greater efficiency, limited expansion into Dublin Harbour and improved road access, particularly to/from the southern port area;

5.1.1.1.3.2 National Development Plan 2018 to 2027

The National Development Plan (NDP) is the companion document to the NPF and is a ten year strategy for public capital investment of almost €116 Billion. This equates to almost €12 Billion annually and represents a substantial increase in the average annual capital budget over that envisaged in the 2nd Infrastructure and Capital Investment Plan 2016-2021. The NDP will underpin the NPF and drive its implementation, as well as driving long-term economic, environmental and social progress across all parts of the country over the next ten years.

The future success of Ireland rests on ensuring readiness for a changing world and the continued successful development of the knowledge economy, and as such on also adopting a strongly strategic approach to public capital investment in the NDP. The NDP represents a response to significant deficits in Ireland's public infrastructure and identifies the strategic priorities for public capital investment for all sectors.

There are many major challenges that form the context for the NPF and the NDP's strategic investment priorities, and these include:

- Demographic change.
- Need for Ireland to become a low-carbon, climate-resilient society.
- Brexit.
- Realising sustainable growth.

The NDP is a blueprint, setting out a strategic framework for public capital investment over the next ten years with a particular focus, beyond simply underpinning the NPF, but on achieving the following over-arching objectives:

- Meeting Ireland's infrastructure and investment needs over the next ten years through a total investment of an estimated €116 Billion over the period.
- Reforming how public investment is planned and delivered by shifting to integrated regional investment plans, stronger co-ordination of sectoral strategies to secure mutually reinforcing outcomes, and more rigorous selection and appraisal of projects to secure value-for-money.

Substantial growth is planned in public capital investment over the coming years, but this must be consistent with the fundamental requirements of overall economic and fiscal sustainability. Over the period 1995 to 2015, Gross Fixed Capital Formation (GFCF) as a share of Gross Domestic Product (GDP) in Ireland was comparable to the EU15 average of 3% over the same period. This indicates that a value of 3% of national income can be considered as an appropriate target for the long-term average level of public capital spending. Under the NDP, it is projected that public capital investment will reach 3.8% of Gross National Income (GNI) in 2021 and 4% by 2024, with sustained investment averaging

4% on an annual basis over the period 2022 to 2027. Public capital investment in Ireland will therefore become among the highest in the EU, and will also ensure that public investment underpins the sustainability of economic growth, but avoids contributing to economic instability and exacerbating any risks of unbalanced and inflationary growth.

Exchequer funding allocated for public capital investment over the ten-year period will amount to €91 Billion and will be supplemented with State-backed investment by commercial State owned enterprises to generate a total 10-year investment programme estimated at €116 Billion. The Exchequer resources allocated for investment under the NDP are based on projected nominal growth in national income (GNI) averaging 4% over the period 2022-2027. This is consistent with long term growth forecasts for the Irish economy produced by various international organisations. The total annual capital expenditure will thus increase from €8.4 Billion in 2018 to €14.0 Billion in 2027 under the Plan.

Indicative resource allocations for delivery of the National Strategic Outcomes, and for named Strategic Investment Priorities under each Outcome, over the period ten-year period are detailed in the Plan (See Table 3.2, p. 21-22 of NDP). These allocations will be updated and adjusted where necessary as the Plan is implemented, in light of:

- Progress achieved in relation to public capital investment priorities currently underway or planned.
- Ongoing assessment of longer-term infrastructural priorities across sectors underpinning the implementation of NPF priorities.
- Different planning horizons applying to different types of capital expenditure.

This will allow for appropriate flexibility and responsiveness of capital allocations to changing circumstances and priorities.

5.1.1.1.4 National Waste Policy

The waste policy statement entitled “Taking Stock and Moving Forward” published in April 2004 reiterates a commitment to the implementation of the internationally recognised waste management hierarchy (DoEHLG 2004a). The integrated waste management approach is to implement maximum recycling, recovery of energy from residual waste and moving away from landfill disposal.

A policy direction WIR 04/05 was issued on 3rd May, 2005 in relation to the movement of waste. This was unforeseen in “Taking Stock and Moving Forward” and was intended to address concerns that relevant regulatory authorities were taking an unnecessarily restrictive approach regarding the inter-regional movement of waste. This guidance is intended to provide greater clarity regarding the appropriate application of the proximity principle to facilitate the provision of environmentally sustainable and economically viable waste infrastructure in accordance with national policy.

Section 21A. (1) of the amended Waste Management Acts 1996 to 2011 states that:-

The following waste hierarchy shall apply as a priority order in waste prevention and management legislation and policy:

(a) prevention;

(b) preparing for re-use;

(c) recycling;

(d) other recovery (including energy recovery); and

(e) disposal.

Measures at the top of the hierarchy have the inherent potential to be more environmentally beneficial and resource efficient. It implies that higher order strategies should be considered first and used where practicable.

Waste prevention is the top priority and when this has been exercised to its full potential then one should attempt to get the maximum benefit from the remaining waste at minimum environmental cost. This is the basis of the **'3 Rs'** which take account of the next steps in the hierarchy:

Reduction (Minimisation) is top of the list since it is the only complete way to reduce environmental impacts.

Reuse is generally better than recycling since there is no processing stage which would use energy and create its own waste.

Recycling is generally better than recovery of secondary materials or energy since it achieves a greater reduction in the demand for primary resources.

To increase the likelihood of applying the Reuse, Recycling, Recovery and Treatment strategies to the best potential it is usually important that the various components in the waste stream are segregated as much as possible to minimise contamination. This usually requires segregation at source and systems to prevent the mixing of different waste streams.

A new National Waste Management Policy was adopted in 2012, and the new Regional Waste Plans are required to reflect this new National Policy (DoECLG, 2012). A key objective of waste management plans is to *"ensure self-sufficiency of waste management infrastructure within the State".* The Plan incorporates several key obligations imposed by the 2008 Waste Framework Directive:

- Application of the Waste Hierarchy as a priority in legislation and policy
- Recovery of waste where practicable, or disposal without risk to environment or human health
- Prohibition of the abandonment or uncontrolled disposal of waste
- Establishment of an integrated network of waste disposal installations and of installations for the recovery of mixed municipal waste - aiming for self-sufficiency
- A system of permits and registration for all those involved in collecting, disposing of, preparing for the recovery of, or recovering waste
- Cost of waste management borne by original waste producer, through adoption of the polluter pays principle.

5.1.1.2 Regional Context

The National Spatial Strategy (NSS) for Ireland sets out the basis on which all areas of the country will have the opportunity to develop to their potential within a national spatial planning framework for the period up to 2020 (DoEHLG, 2002). The Regional Authorities have been entrusted with the important responsibility of implementing the NSS at regional level.

The Planning and Development Act, 2000 conferred on the Regional Authorities the power to make Regional Planning Guidelines (RPGs) for their functional areas. The RPG, which also incorporate a socio-economic development strategy, are intended to constitute a strategic planning framework for the period 2010-2022 for the development of each region and for inter-regional cooperation. The strategic policies and objectives set out in the RPG will form the backdrop for socio-economic planning by national and regional agencies and will constitute the policy framework within which county, city, town and local area development plans will be made. Thus, although the NSS has been revoked, its legacy persists in the Regional Planning Guidelines (RPGs), which remain in effect until 2022 or until otherwise replaced by new Regional Spatial & Economic Strategies (RSES).

The Regional Planning Guidelines (RPGs) extend the implementation of the National Spatial Strategy (NSS) down to the regional and local levels, by linking national spatial policy with planning by local authorities.

The Southern, the Northern and Western, and the Eastern and Midland Regional Assemblies were established on 1st January 2015, following on from the dissolution of the BMW and Southern & Eastern Regional Assemblies, under the Government's regional reform process as enacted in the Local Government Reform Act 2014.

5.1.1.2.1 Regional Planning Guidelines for the Greater Dublin Area

The Regional Planning Guidelines for the Greater Dublin Area (GDA) combines two Regional Authority areas - the Dublin Regional Authority and the Mid-East Regional Authority. The Guidelines cover the Councils of Dun Laoghaire-Rathdown, Dublin City, Fingal and South Dublin in the Dublin Region and Kildare, Meath and Wicklow County Council areas in the Mid-East Region.

The Regional Planning Guidelines (RPG's) set out the planned direction for growth within the Greater Dublin Area up to 2022 by giving regional effect to national planning policy under the National Spatial Strategy (NSS).

The Regional Planning Guidelines for the Greater Dublin Area (GDA) shall continue to have effect until a Regional Spatial and Economic Strategy is prepared and adopted by the Eastern Regional Assembly.

The RPGs seek to deliver policies integrating land use, transport, economic growth and investment in utilities - water, broadband and energy so that the GDA can move towards becoming a sustainable high quality location for business, residents and visitors.

It is the strategic policy (PIP5) of the GDA to ensure, from environmental, business and public health needs, that waste management remains a priority for local authorities and waste management regions in continuing to invest in promoting and facilitating reuse and recycling

by residential and commercial sources and that high standard options for treatment and final disposal of waste are available within the GDA.

The Waste management policy for the GDA needs to:

- Expand policies to promote and support source reduction and reuse, to reduce stresses on waste management infrastructure and to create better synergies between businesses and across sectors;
- Promote improvements to quality of recycling infrastructure to reduce costs;
- Continue to invest in increasing opportunities for recycling and safe disposal of waste;
- Development of opportunities, as outlined above, shall not compromise the integrity of ecologically sensitive areas, in particular infilling with inert materials which can give rise to fragmentation of habitats. A change in the regulations that effectively exempts land filling once it achieves land reclamation would support this endeavour.

Preservation of the environment and conservation of diminishing natural resources are key principles inherent within the concept of sustainable development. The RPGs support the waste management hierarchy, and increased and coordinated effort should be made in the areas of source reduction and re-use of waste across the industrial, commercial and residential sectors of the GDA.

Local Authorities should seek to anticipate burgeoning waste streams, identify opportunities to integrate facilities where appropriate and identify current or future opportunities for re-use of waste, for example, the re-use of secondary aggregates, or the potential reuse of suitable soil material in amenity projects or landfill restoration.

Strategic recommendations for the GDA include:

PIR39 *The reuse of waste should be encouraged and reinforced through encouragement of business clustering across the GDA. Opportunities to facilitate source reduction, the reuse of wastes, by-products and associated energy throughout the GDA should be examined as part of economic policies. Development of these opportunities shall not compromise the integrity of ecologically sensitive areas, in particular infilling with inert materials which can result in loss and fragmentation of wetlands.*

PIR 40 *Waste management facilities should be appropriately managed and monitored according to best practice to maximise efficiencies and to protect human health and the natural environment.*

5.1.1.2.2 Regional Waste Management Plan

The waste management regions have recently been reconfigured, and Meath now comes under the Eastern & Midlands Waste Region (EMWR). The EMWR was established following on from the publication of Government Policy document “A Resource Opportunity - Waste Management Policy in Ireland” (DoECLG. 2012), which reduced the Waste Management Regions from 10 to 3. The region includes Dublin City, Dun Laoghaire-Rathdown, South Dublin, Fingal, Wicklow, Kildare, Laois, Offaly, Westmeath, Longford, Meath and Louth County Councils.

The Eastern-Midlands Region Waste Management Plan 2015 – 2021 provides the framework for waste management for the next six years and sets out a range of policies and actions in order to meet the specified mandatory and performance targets. Most importantly the plan seeks to assist and support the community and local business to develop resource efficiency and waste prevention initiatives.

The economic recession impacted on the generation of wastes in the region, specifically wastes from the building sector, with annual records showing a steady decline in quantities for major waste streams. Since the beginning of 2014 the economy has shown signs of sustained recovery, and this is expected to continue, which will likely lead to growth in waste generation over the period of the plan. The continued management of wastes in a safe and sustainable manner will be a real challenge into the future.

The strategic approach of the plan places a stronger emphasis on preventing wastes and material reuse activities. The plan will also focus on enhancing the collection of quality materials from discarded waste to build on the positive progress made in recycling. The plan will strive to improve the recovery and generation of energy by maximising the resource value of the materials and energy embodied in residual wastes. Finally, the plan will seek to further reduce the role of landfilling in favour of higher value recovery options.

The following subsections provides a summary of the EMRWP 2015 – 2021 including relevant policies with respect to management of Construction and Demolition waste.

5.1.1.2.2.1 Construction and Demolition (C&D) waste

Construction and Demolition (C&D) waste is described in the EPA National Waste Reports as all waste that arises from C&D activities.

The national policy document, Changing Our Ways (1998), set a target of 85% recycling of C&D waste by 2013. The local authorities recognise the extent of inert, non-hazardous and hazardous waste streams being generated in the region and nationally. The management of these streams places specific obligations on the authorities, and the policies and actions of the plan are designed to ensure that the authorities are contributing to proper management.

Policy:

A3. Contribute to the improvement of management performance across all waste streams through the implementation of policy actions and monitor progress towards national targets.

The 2008 EU WFD Directive also requires a 70% reuse, recycling and materials recovery rate target of non-soil and stone construction and demolition waste to be achieved by 2020. The State is exceeding this target, with a rate of 97% recorded in 2012.

As the construction sector begins to record increasing activity, the importance of construction and demolition plans, and their enforcement must be stressed. Equally, the appropriate

processing facilities need to be in place to facilitate increased reuse, recycling and recovery of this waste stream.

C&D waste is primarily collected by private authorised collectors, with only a small percentage collected at civic amenity facilities. The C&D sector has been showing signs of recovery in the region since 2012 and has gathered pace significantly within the last year with the commencement of a number of significant construction projects.

The soil and stone waste collected within the EMR is primarily managed at local authority permitted infill sites with the other C&D waste types primarily managed at EPA licensed activities.

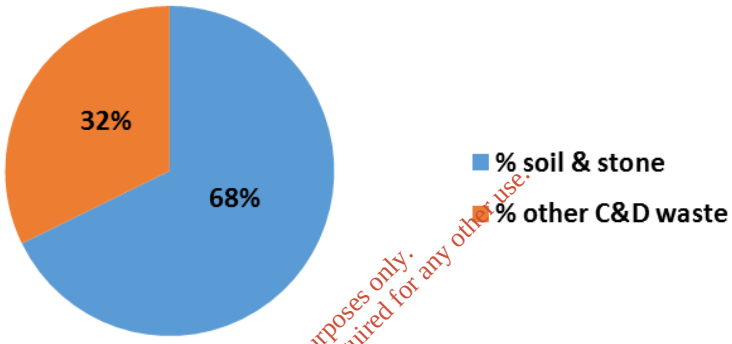

Figure 5.1-1 C&D Wastes Collected in the Eastern-Midlands Region in 2012

Traditionally, the recovery of much of the C&D waste stream has been managed by placing it in a variety of land use applications. This treatment, collectively known as backfilling, includes land reclamation, improvement or infill works. The largest fraction of the C&D waste stream arising is soil and stones, which (if uncontaminated) typically undergoes little if any treatment prior to recovery at these sites. Many sites selected for infill facilities are considered marginal agricultural land, and may include wetland habitats or lands subject to flooding. There is an increasing recognition of the potential ecological and biodiversity value of these wetland sites. There is also a sense that at many of these sites, the deposition of waste material rather than improvement or development of the land was the primary purpose of the activity.

Given the sharp decrease in the number of operational landfills nationally, which have been a significant outlet for C&D waste in the past, alternative recovery options will be required to facilitate the recovery of C&D waste arising in future years. It needs to be considered if the placement of inert waste at many of the types of infill sites used in the past is an appropriate land-use strategy or indeed best use of a potentially recyclable material. Concrete, stone and other masonry-type waste can be crushed and screened and used as a substitute for virgin quarried stone material in a variety of engineering applications if the appropriate technical criteria have been met, e.g. road construction, access tracks for agricultural or forestry holdings.

Quarries also frequently require large quantities of soil material to fill voids, and for other remediation and landscaping applications.

There is significant potential for recycling of the C&D waste stream given the nature of its characteristics.

Much of the inert fraction of the C&D waste stream, particularly concrete, can be recycled and used in engineering applications as a replacement for virgin materials. At present, recycling is not being distinguished from recovery in the recording and reporting of waste statistics for construction and demolition waste.

5.1.1.2.2.2 Recovery – Backfilling

Backfilling activities (of inert waste), which meet the recovery definition and are in compliance with Articles 4 and 13 of the WFD, sit on the other recovery tier of the waste hierarchy. Local authorities in the region authorise such activities through the award of WFPs and CoRs.

Similarly, the EPA authorises significant backfilling of inert waste at large sites such as old quarries for restoration purposes.

Backfilling activities make up a significant treatment capacity in the region at present. Local authority authorised sites have a capacity of 0.9 million tonnes, with significant pending capacity for facilities at waste licence application stage. Local authority authorised sites generally have a shorter lifespan than EPA licensed sites and operations can often cease at these sites within the life of the permit, i.e. five years. EPA authorisations cover more substantial operations with a longer lifetime capacity. Utilisation of active local authority capacity at backfilling/land improvement sites was 48% in 2012. Activity in the sector is expected to increase over the plan period as economic recovery continues to build nationally.

Policies:

E13. Future authorisations by the local authorities, the EPA and An Bord Pleanála must take account of the scale and availability of existing back filling capacity.

E14. The local authorities will co-ordinate the future authorisations of backfilling sites in the region to ensure balanced development serves local and regional needs with a preference for large restoration sites ahead of smaller scale sites with shorter life spans. All proposed sites for backfilling activities must comply with environmental protection criteria set out in the plan.

In the face of increased demand for backfilling authorisations there is a need for better coordination between local authorities in the region. This is to ensure facilities are planned and developed at suitable sites and do not present a risk to European designated sites and existing biodiversity and habitats. It is recommended that the lead authority liaise with relevant stakeholders (including the EPA and the DAHG) to ensure appropriate measures are in place

for the control and spread of invasive alien species at backfilling sites in the region where necessary.

5.1.1.2.2.3 Recycling – Material Reprocessing

The reprocessing of waste materials into products, materials or substances "*whether for the original or other purposes*" falls within the recycling definition. Ireland's reprocessing industry for secondary waste materials is limited, with the greater part of municipal recyclable wastes being exported.

In many cases the quantity of feedstock available in Ireland is not sufficient to make the development of indigenous recycling or reprocessing facilities economically viable.

Over the lifetime of the plan the local authorities in the region will support the development of indigenous secondary waste market reprocessing.

Policies:

E19. The waste plan supports the development of indigenous reprocessing and recycling capacity for the treatment of non-hazardous and hazardous wastes where technically, economically and environmentally practicable. The relevant environmental protection criteria for the planning and development of such activities need to be applied.

5.1.1.2.2.4 Facility Authorisations by Local Authorities

Local authorities will implement a coordinated and considered approach to the future planning of treatment capacities in the region through better communication (between authorising bodies) and ongoing updates of regional capacity data.

Policies:

E21. The Local Authorities will review the approach to authorising waste treatment facilities requiring a waste facility permit or certificate of registration having regard to the need to achieve consistency of approach between planning approval and operational capacity.

5.1.2 REFERENCES

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ESRI (2017). *Quarterly Economic Commentary*. Winter 2017, Economic & Social Research Institute (ESRI), Dublin, Ireland.

Meath County Council (2013). *Meath County Development Plan (2013-2019*). Meath County Council, Navan, Co. Meath, Ireland.

5.2 GENERAL GUIDANCE ON BASELINE ENVIRONMENT & IMPACTS

The following guidance was extracted from EPA (2015b, 2017).

The main purpose of an EIAR is to identify, describe and present an assessment of the likely significant impacts of a project on the environment.

It should contain:

“A description of the likely significant effects of the project on the environment resulting from, inter alia:

a) the construction and existence of the project, including, where relevant, demolition works;

b) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources;

c) the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste;

d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);

e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources;

f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change;

g) the technologies and the substances used.

5.2.1 DESCRIPTION OF EXISTING/RECEIVING ENVIRONMENT

Baseline information should, in the first instance, be sourced from published references to ensure reliability and objectivity.

It is important for the EIAR to draw attention to limitations about factors that may affect the reliability of baseline data. These can include the availability, completeness, accuracy, age and accessibility of data.

The need for site specific and up-to-date data is reviewed on a case-by-case basis in the context of available data and to determine whether new surveys or research are required.

Refer to Advice Notes for more detail on baseline information (EPA, 2015b).

To facilitate evaluation of the EIAR, references to recognised descriptive standards and classifications should be included, where appropriate, as well as supporting records, information and descriptions of methodologies employed.

5.2.2 BASELINE DESCRIPTION

Systematic, accurate and comprehensive descriptions include descriptions of the context, character, significance and sensitivity of the existing environment.

BASELINE DESCRIPTIONS REQUIRED	
Context	Describe the location, magnitude, spatial extent and trends of the environmental factor,
Character	Indicate the distinguishing aspects of the environment under consideration
Significance	What quality, value or designation is assigned to this aspect of the existing environment,
Sensitivity	How sensitive is this aspect of the environment to change,

5.2.3 EFFECTS/IMPACTS

The description of the likely significant effects on the "environmental factors" should cover the direct effects and any indirect/secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the project."

It may be useful to consider such impacts in light of the criteria listed in Annex III of the amended Directive.

a) the magnitude and spatial extent of the impact (for example geographical area and size of the population likely to be affected);

b) the nature of the impact;

c) the transboundary nature of the impact;

d) the intensity and complexity of the impact;

e) the probability of the impact;

f) the expected onset, duration, frequency and reversibility of the impact;

g) the cumulation of the impact with the impact of other existing and/or approved projects;

h) the possibility of effectively reducing the impact.

5.2.4 DESCRIPTIONS OF EFFECTS

Each effect usually needs to be qualified to provide a comprehensive description of the predicted effect on receptors.

The EIAR should focus on the likely, significant effects.

The extent to which the effects of major accidents and/or disasters are examined in the EIAR should be guided by an assessment of the likelihood of their occurrence (risk). This may be supported by general risk assessment methods or by systematic risk assessments required under other regulations, e.g., a COMAH (Control of Major Accident Hazards involving Dangerous Substances) assessment.

The potential for a project to cause risks to human health, cultural heritage or the environment due to its vulnerability to external accidents or disasters is considered where such risks are significant, e.g. the potential effects of floods on sites with sensitive plants. Where such risks are significant then the specific assessment of those risks in the form of a Seveso Assessment (where relevant) or Flood Risk Assessment may be required. The EIAR should refer to those separate assessments while avoiding duplication of their contents.

Checklist for Information required to describe effects page 55 of EPA (2017).

Quality of Effects It is important to inform the non-specialist reader whether an effect is positive, negative or neutral	**Positive Effects** A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or by removing nuisances or improving amenities).
	Neutral Effects No effects or effects that are imperceptible, within normal bounds of variation or within the margin of forecasting error.
	Negative/adverse Effects A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).
Describing the Significance of Effects ''Significance' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful (also see *Determining Significance* below.).	**Imperceptible** An effect capable of measurement but without significant consequences.
	Not significant An effect which causes noticeable changes in the character of the environment but without significant consequences.
	Slight Effects An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.
	Moderate Effects An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.
	Significant Effects An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.

	Very Significant An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.
	Profound Effects An effect which obliterates sensitive characteristics
Describing the Extent and Context of Effects Context can affect the perception of significance. It is important to establish if the effect is unique or, perhaps, commonly or increasingly experienced.	**Extent** Describe the size of the area, the number of sites, and the proportion of a population affected by an effect.
	Context Describe whether the extent, duration, or frequency will conform or contrast with established (baseline) conditions (is it the biggest, longest effect ever?)
Describing the Probability of Effects Descriptions of effects should establish how likely it is that the predicted effects will occur – so that the CA can take a view of the balance of risk over advantage when making a decision.	**Likely Effects** The effects that can reasonably be expected to occur because of the planned project if all mitigation measures are properly implemented
	Unlikely Effects The effects that can reasonably be expected not to occur because of the planned project if all mitigation measures are properly implemented.
Describing the Duration and Frequency of Effects 'Duration' is a concept that can have different meanings for different topics – in the absence of specific definitions for different topics the following definitions may be useful.	**Momentary Effects** Effects lasting from seconds to minutes
	Brief Effects Effects lasting less than a day
	Temporary Effects Effects lasting less than a year
	Short-term Effects Effects lasting one to seven years.
	Medium-term Effects Effects lasting seven to fifteen years.

	Long-term Effects Effects lasting fifteen to sixty years.
	Permanent Effects Effects lasting over sixty years
	Reversible Effects Effects that can be undone, for example through remediation or restoration
	Frequency of Effects Describe how often the effect will occur. ((once, rarely, occasionally, frequently, constantly – or hourly, daily, weekly, monthly, annually))
Describing the Types of Effects	**Indirect Effects (a.k.a. Secondary Effects)** Impacts on the environment, which are not a direct result of the project, often produced away from the project site or because of a complex pathway.
	Cumulative Effects The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects.
	'Do-Nothing Effects' The environment as it would be in the future should the subject project not be carried out.
	`Worst case' Effects The effects arising from a project in the case where mitigation measures substantially fail.
	Indeterminable Effects When the full consequences of a change in the environment cannot be described.
	Irreversible Effects When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost.

	Residual Effects The degree of environmental change that will occur after the proposed mitigation measures have taken effect.
	Synergistic Effects Where the resultant effect is of greater significance than the sum of its constituents, (e.g. combination of SOx and NOx to produce smog).

5.2.5 REFERENCES

EPA (2015). *Advice Notes on Current Practice for preparing Environmental Impact Statements, Draft.* Environmental Protection Agency (EPA). Johnstown Castle, Wexford, Ireland.

EPA (2017). *Guidelines on the Information to be contained in an Environmental Impact Assessment Report, Draft*. Environmental Protection Agency (EPA). Johnstown Castle, Wexford, Ireland.

5.3 WATER

5.3.1 ENVIRONMENTAL ASSESSMENT AND RISK ASSESSMENT REPORT OF PHASE 2 RESTORATION AREA

HYDRO ENVIRONMENTAL SERVICES

22 Lower Main St
Dungarvan
Co.Waterford
Ireland

tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

CLASHFORD WASTE RECOVERY FACILITY, THE NAUL, CO. MEATH

ENVIRONMENTAL ASSESSMENT AND RISK ASSESSMENT REPORT OF PHASE 2 RESTORATION AREA

FINAL REPORT

Prepared for:
JSPE Ltd

Prepared by:
HYDRO-ENVIRONMENTAL SERVICES

DOCUMENT INFORMATION

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AUTHORS:	**MICHAEL GILL BRIAN COFFEY DAVID BRODERICK**
SIGNED:	Michael Gill **MICHAEL GILL B.A., B.A.I., M.SC. DIP. GEOL, MIEI, MCIWEM MANAGING DIRECTOR – HYDRO-ENVIRONMENTAL SERVICES**

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Certain statements made in the report that are not historical facts may constitute estimates, projections or other forward looking statements and even though they are based on reasonable assumptions as of the date of the Report, such forward-looking statements by their nature involve risks and uncertainties that could cause actual results to differ materially from the results predicted. HES specifically does not guarantee or warrant any estimate or projections contained in this Report.

Where field investigations are carried out, these have been restricted to a level of detail required to meet the stated objectives of the services. The results of any measurements taken may vary spatially or with time and further confirmatory measurements should be made after any significant delay in issuing this Report.

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1. INTRODUCTION

1.1 BACKGROUND

Hydro-Environmental Services (HES) were commissioned by J. Sheils Planning and Environmental Ltd (JSPE), acting on behalf of Clashford Waste Recovery Facility (WRF), to complete an Environmental Assessment of the Phase 2 Restoration Area within the Clashford Waste Recovery Facility. Clashford WRF is located at The Naul, Co. Meath. The waste recovery facility currently has a waste licence application (W0265-01) under assessment in the Environmental Protection Agency (EPA), and is centred on the phased restoration of a sand and gravel pit using imported inert soil and stone and the recovery of inert construction and demolition waste.

A site location map is shown as **Figure A,** and **Figure B** shows an aerial view of the Clashford WRF site, and includes the Phase 2 Restoration Area boundary.

A notice issued by the EPA on 18th December 2017 under Article 16(1) of the Waste Management (Licencing) Regulations 2004, required an environmental liabilities risk assessment (ELRA) to be prepared in accordance with *Guidance on assessing and costing environmental liabilities* (EPA 2014). This (characterisation) report identifies the environmental risks associated with the Clashford site to allow the ELRA to be undertaken. The ELRA is completed by others on the Project Team. This report is focused on the Phase 2 Restoration Area of the Clashford WRF site. The Phase 2[1] Restoration Area is identified on **Figure B**.

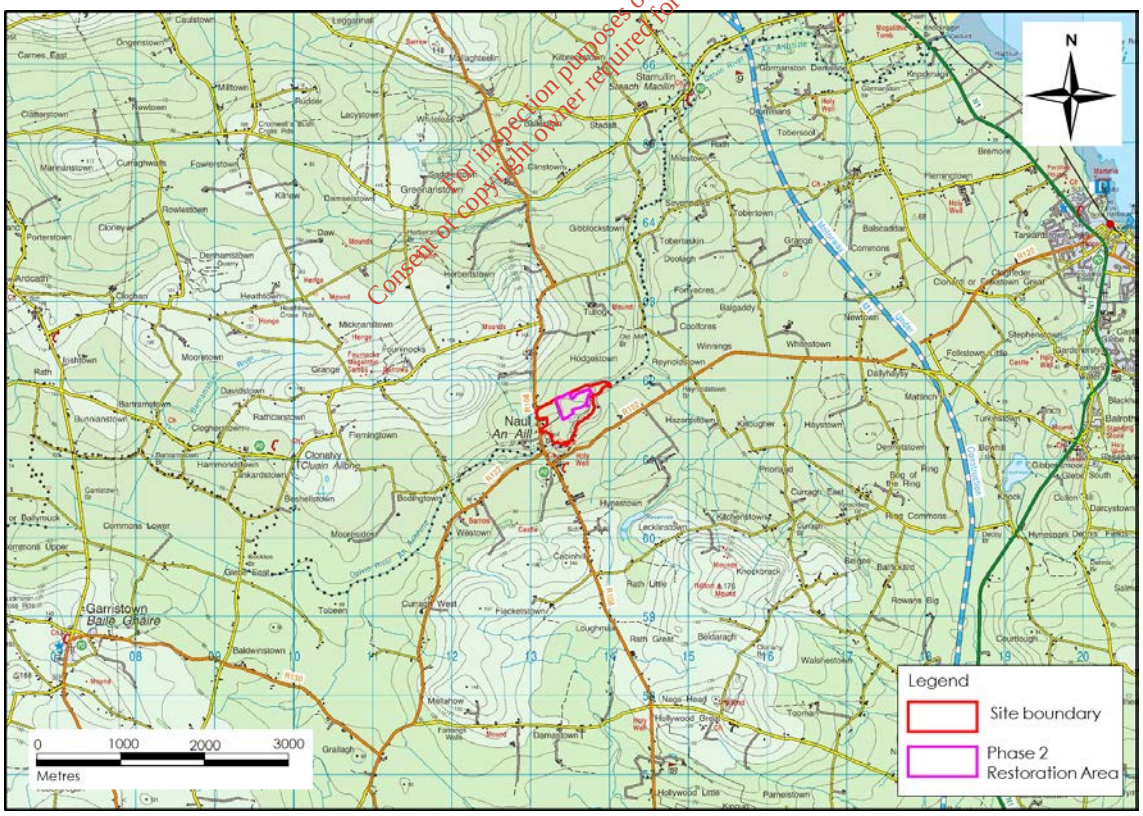


Figure A: Site Location

[1] *3 phases of fill were proposed in the 2009 EIS.*

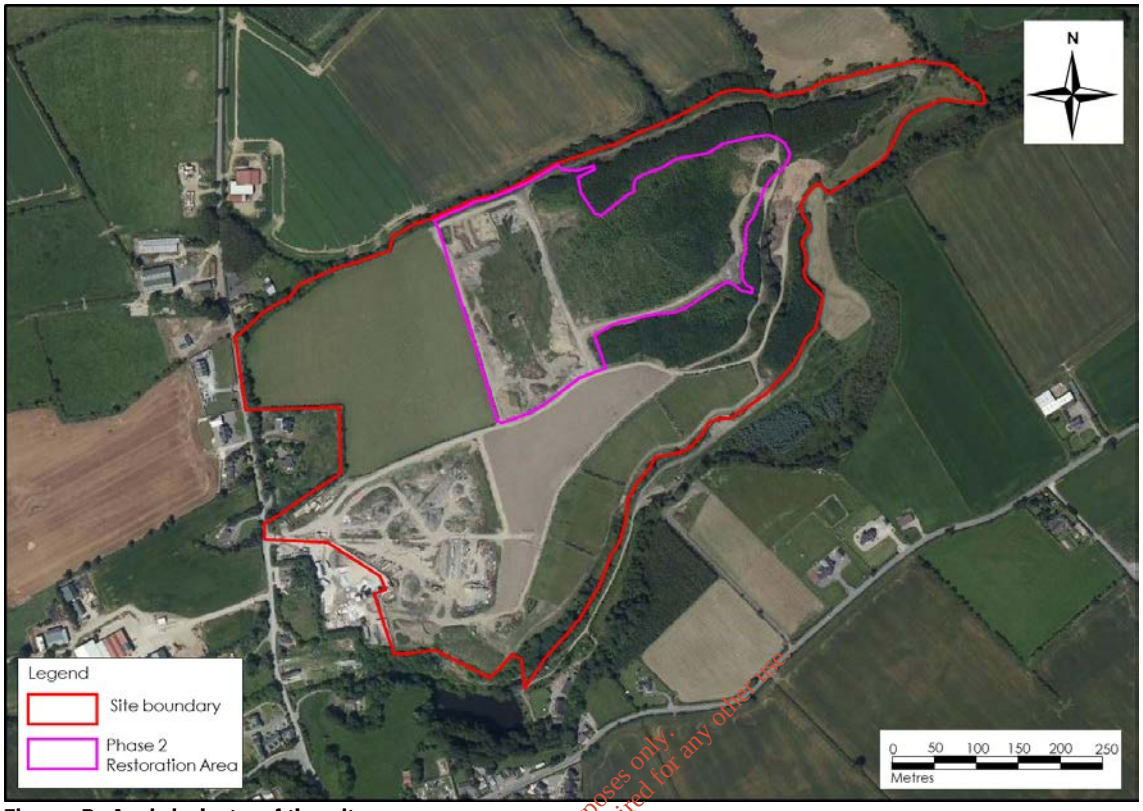


Figure B: Aerial photo of the site

1.1. ASSESSMENT OBJECTIVES

The objective of this Environmental Assessment is to present available environmental data, including site investigation data and laboratory analyses of samples (soil and water) from the site, and assess potential environmental and human health risk associated with the site.

1.2. SOURCES OF INFORMATION

General desk study sources of information are as follows:

- Environmental Protection Agency database (www.epa.ie);
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Met Eireann Meteorological Databases (www.met.ie);
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive "WaterMaps" Map Viewer (www.wfdireland.ie);
- Bedrock Geology 1:100,000 Scale Map Series, Sheet 13 (Geology of Meath). Geological Survey of Ireland (GSI, 2003);
- Geological Survey of Ireland - Groundwater Body Characterisation Reports;
- OPW Indicative Flood Maps (www.floodmaps.ie);
- Environmental Protection Agency – "Hydrotool" Map Viewer (www.epa.ie);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie); and,
- Department of Environment, Community and Local Government on-line mapping viewer (www.myplan.ie).

1.3. SCOPE OF WORK & ASSESSMENT METHODOLOGY

HES have completed the following scope:

- Several site visits and walkover surveys;
- Desk study and background data review;
- Assessment of historic groundwater and surface water quality data;
- Site investigation works including borehole drilling and soil sampling, trial pit excavation and soil sampling, and groundwater and surface water sampling from existing monitoring locations;
- Soils data and groundwater quality data collation and assessment; and,
- Interpretation and reporting on current soil, groundwater, and surface water conditions at and downstream of the Phase 2 Restoration Area and the Clashford WRF site.

2. BACKGROUND INFORMATION

2.1. SOURCES OF DATA

2.1.1. Desk Study

Desk study information for the site and surrounding area was largely compiled and reviewed prior to undertaking the initial walkover survey (for this current phase of site work)[2] completed on 13th March 2018. The desk study involved collecting all relevant geological, hydrological, hydrogeological and meteorological data for the area.

2.1.2. Previous Site Monitoring

As part of this current assessment, historical monitoring data is considered together with recent site investigation data completed by HES on 13th March 2018 and 23rd April through to 1st May 2018.

A map showing the locations of all investigation points (including boreholes, trial pits and monitoring well locations) is attached as **Figure 1**. This map also shows monitoring well locations and previous trial pit locations which were completed in 2009[3].

2.2. SITE DESCRIPTION & TOPOGRAPHY

The part of site subject of this Environmental Assessment is the Phase 2 Restoration Area within the Clashford Waste Recovery Facility site boundary as identified on **Figure B**. The entire site was used as a sand and gravel quarry from the early 1980s. Since 2001, the quarry has been progressively restored in accordance with a Phased Restoration Scheme using imported soil and stone, and some inert construction and demolition waste (predominantly concrete used in haul road construction) subject to successive Waste Management Permits granted by Meath County Council (e.g., Waste Permit Reg. No. WMP 2005/25). It is proposed that restoration will continue at the site using imported inert soil and stone, and recovery of inert construction and demolition waste to produce secondary aggregates.

The topography of the site area is mostly flat in the centre of the site which slopes from the centre to the north and from the centre to the south towards the two watercourses that define part of the site boundary. The topography of various areas within the site have been altered through excavation and backfilling. The ground levels range between ~60-80mOD (being lowest on the western side and highest in the eastern side of the site.

A more detailed description of the site and potential pollution linkages (source-pathway–receptor) are outlined below in **Section 5.2**.

2.3. ADJACENT LAND USE

The Clashford site is located immediately north of the village of Naul, located on the Dublin-Meath border. Land use surrounding the subject site is generally agricultural in nature, composed of both grassland and tillage. There are a number of residential dwellings on the R108 that runs along the western boundary of the site. Adjacent to the site is a concrete plant operated by Kilsaran. The Naul wastewater treatment plant (capacity 400 PE) is located on the southern bank of the Delvin River, approximately 130m southwest of the Clashford WRF site. This WWTP discharges into the Delvin River upstream of the Clashford WRF site.

[2] *HES have been working on this site since October 2015. All previous knowledge regarding the site is also used in this report.*
[3] *Trial pitting completed by Dr. Robbie Meehan in 2009, included as Attachment I.5.1 in 2009 Waste Licence Application.*

2.4. HYDROLOGY

2.4.1. Regional and Local Hydrology

Regionally, the subject site is located within Hydrometric Area 08. The site is located in the Nanny-Delvin catchment and in the Delvin_SC_010 sub-catchment under the Water Framework Directive ("WFD").

The Delvin River flows in a west to northeast direction across the site's southern boundary. In addition, a tributary of the Delvin River flows along the northern boundary of the site and joins the Delvin at the most easterly tip of the site.

Surface water drainage within the Phase 2 Restoration Area is generally to the north, and drains via existing settlement ponds, and then into the tributary to the Delvin River which forms the north-western boundary of the Clashford WRF site. This stream flows to the northeast and enters the Delvin River downstream of the Clashford WRF site. A local drainage map is shown as **Figure C**.

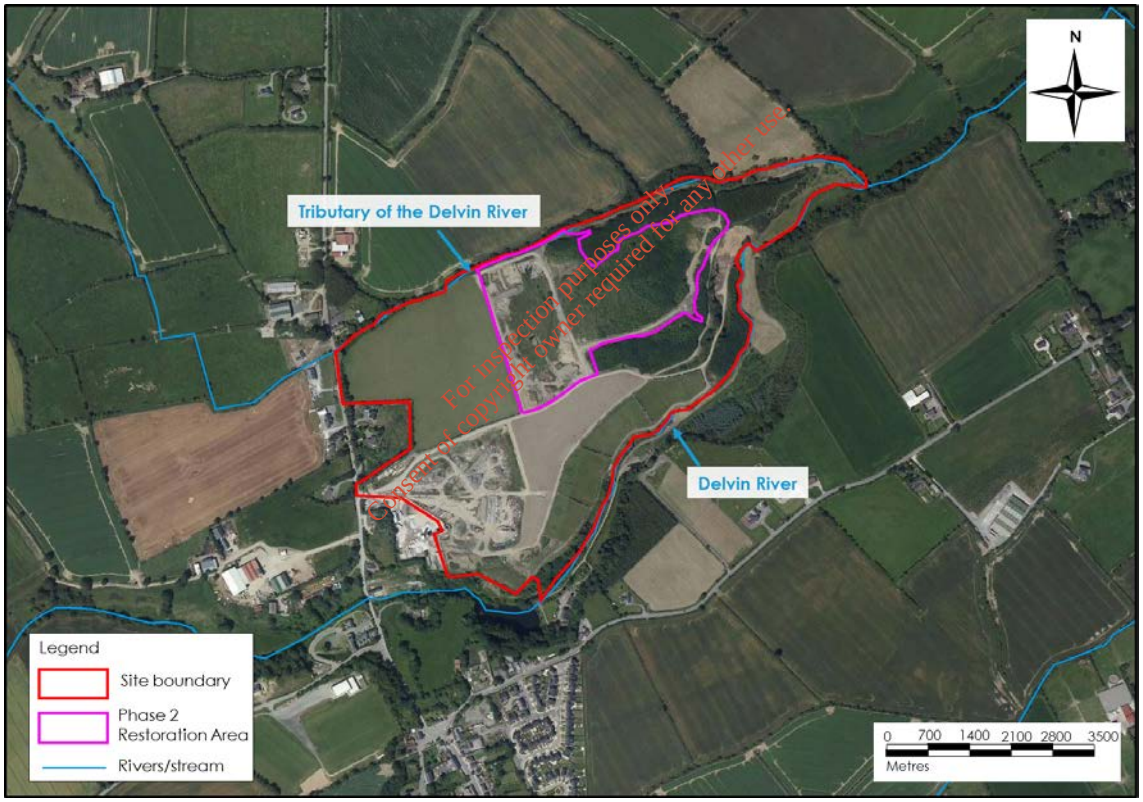


Figure C: Local Hydrology Map

2.4.2. Rainfall and Evaporation

The SAAR (Standard Average Annual Rainfall) recorded at Bellewstown (Collierstown) (~5km northwest) is 838mm (www.met.ie).

The average potential evapotranspiration (PE) at Dublin Airport station is taken to be 560mm (www.met.ie). The actual evapotranspiration (AE) is calculated to be 532mm (95% PE). Using the above figures the effective rainfall (ER)[4] for the area is calculated to be (ER = SAAR – AE) 306mm.

[4] *ER – Effective Rainfall is the excess rainfall after evaporation which produces overland flow and recharge to groundwater.*

2.4.3. WFD Surface Waterbody & Status

As discussed, the subject site is located between two surface waterbodies (www.catchments.ie), the Delvin River and its tributary. Both of these waterbodies have been assigned an overall status designation of "Moderate" and are noted as being at "At Risk" in terms of its overall risk designation.

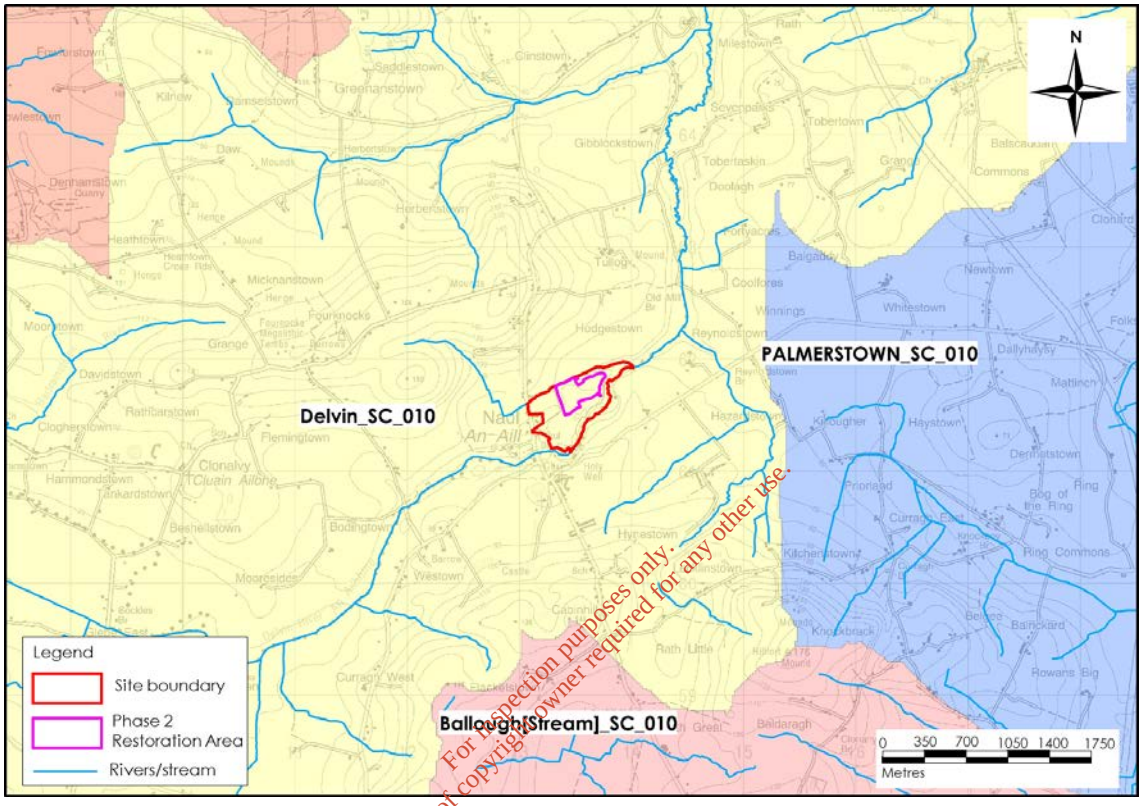


Figure D: WFD Surface Waterbody Map

2.5. SITE GEOLOGY

The site geology in this section is presented using mapped data from GSI/Teagasc datasets, previous site investigation data (JSPE, 2009) and recently collected site data collected at the Clashford site. Geological datasets are derived from the following:

- 13 no. trial pits completed in 2009;
- 2 no. monitoring wells drilled in 2014;
- 1 no. monitoring well drilled in 2017;
- 18 no. trial pits completed in 2018; and,
- 6 no. boreholes completed in 2018.

2.5.1. Mapped Soils and Subsoils

According to GSI mapping, the subject site contains a number of topsoil types (**www.gsi.ie**). The most common soil type within the site is shallow well drained mineral soils from acidic parent material, with some areas of shallow, poorly drained mineral soils. In reality, due to the use of the site as a quarry/extraction pit in the past, a large amount of the soil/overburden has been removed. Along the Delvin River the soil is mapped as mineral alluvium.

The mapped subsoil type (**www.gsi.ie**) for the subject site is almost all mapped as gravels derived from Lower Palaeozoic sandstones and shales (GLPSsS), with an area of Bedrock

outcrop or subcrop (Rck) in the south of the site and mineral alluvium (A) along the Delvin River.

Site investigation work carried out on the subject site allows for a more accurate understanding of the current site subsoil. An assessment was carried out by Dr. Robert Meehan on behalf of JSPE on 6th January and 21st January 2009[5]. In this investigation, the general site area included various depths of topsoil, and this was underlain by unmottled SILT/CLAY. In some poorly drained areas the subsoil material was found to be heavily consolidated, either naturally stiff or over-compacted.

Site investigations in 2018, undertaken by HES, have identified similar soils and subsoils geology. In addition, a number of the completed boreholes penetrated deep enough to encounter the underlying natural ground. This confirms that subsoils below the fill material comprises sand and gravels and some silts. The underlying natural material was generally found to be clean and dry, with no evidence of leaching or contamination.

The majority of the fill material encountered in the 2018 site investigation comprised of SILT and CLAY consistent with the glacial deposits found in Meath and North County Dublin (glacial tills and boulder clays).

2.5.2. Mapped Bedrock Geology

The bedrock underneath the proposed site area is mapped by the GSI as Ordovician Metasediments (OM) in the north and centre of the site and Dinantian Pure Unbedded Limestones (DPUL) in the south of the site.

GSI Sheet No. 13, Bedrock Geological Map of Meath, indicates that the majority of the site is underlain by brown-grey mudstone and siltstone from the Clashford House Formation with andesite sheets of the Herbertstown Formation sporadically occurring throughout. The southeastern section of the site is mapped as mudbank limestone.

Bedrock outcrops noted in the eastern end of the site are consistent with the brown-grey mudstone and siltstone from the Clashford House Formation.

2.6. HYDROGEOLOGY

2.6.1. Local Hydrogeology

The Ordovician Metasediments which are mapped to underlie the north and centre of the site are classified by the GSI as a Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones (Pl). The Dinantian Pure Unbedded Limestones in the south of the site are classified as a Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones (Ll)

These rock types represent the boundary of two groundwater bodies (GWB). The Ordovician Metasediments are part of the Duleek GWB (IE_EA_G_012) and the limestones form part of the Lusk GWB (IE_EA_G_014).

The site contains two mapped bedrock fault lines, on the north and south of the Lusk GWB. There are no local mapped karst features mapped in the area of the Clashford WRF site. The Phase 2 Restoration Area is underlain by the Duleek GWB.

[5] *Assessment of Filled Subsoils for Waste Licence Application at Naul, Co. Meath, Final Report, Prepared by EurGeol Dr. Robert T. Meehan P. Geo, Report Reference No. 16046, dated 10th February 2009.*

According to the "Duleek GWB: Summary of Initial Characterisation" produced by the GSI, this aquifer will discharge to the overlying rivers and streams in the area as baseflow (i.e. for the site this is towards the Delvin River). The low permeability rocks in the area will not sustain large summer baseflows and it is more likely that the majority of groundwater flow will discharge to the rivers after a short lag time in the weathered zone of the aquifer. Most flow in this aquifer will occur near the surface. In general, the majority of groundwater flow occurs in the upper 10m, comprising a weathered zone of a few metres and a connected fractured zone below this. Flowpaths are not considered to extend further than the nearest surface water feature and will generally not be greater than 500m (GSI 2003).

A local hydrogeology map is shown as **Figure E**.

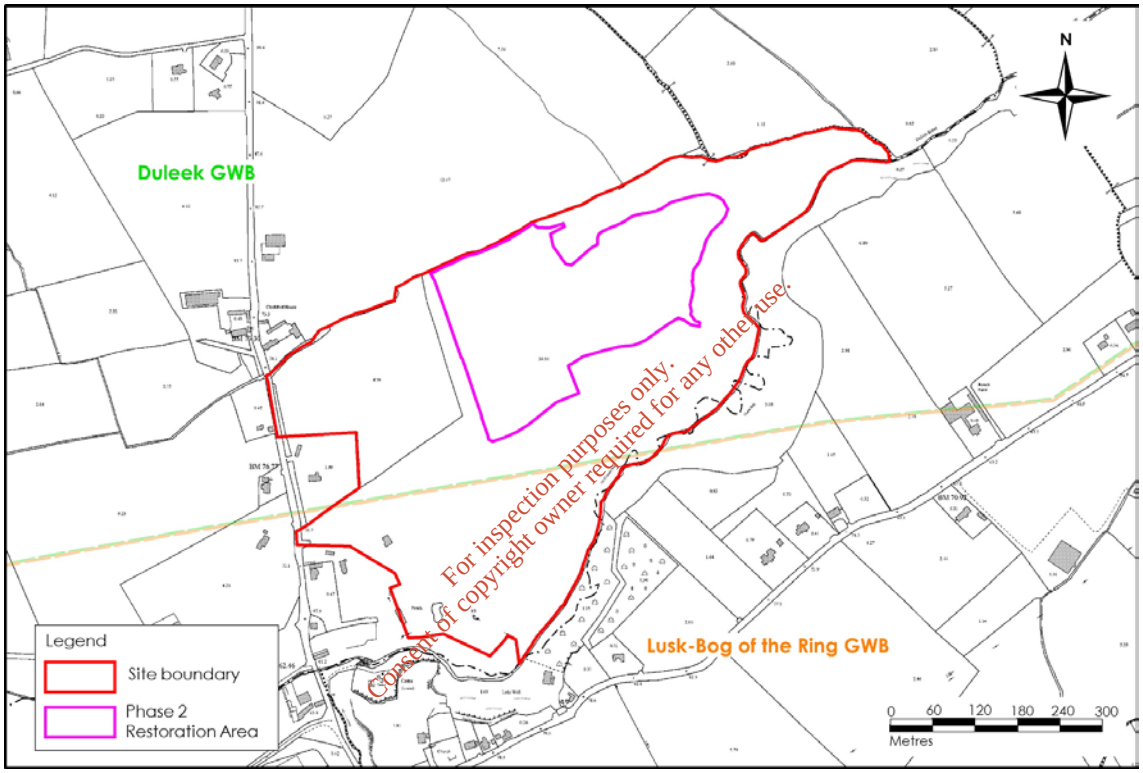


Figure E: Local hydrogeology map

2.6.2. Clashford Site Groundwater Conditions & Flow Direction

JSPE (2014) reported that the groundwater flow within the bedrock was found to be generally flowing across the site from northwest to southeast towards the Delvin River. This was determined via the hydraulic gradient measured in groundwater wells at the site at this time.

Groundwater flow direction determined from recent monitoring data is presented at Section 4.3 below. Groundwater flow is confirmed as being to the east-southeast towards the Delvin River. Groundwater elevations at the site vary between ~43.9 and ~68.45 mOD. Water levels fluctuate seasonally between 1-2m in all on site monitoring wells.

2.6.3. Groundwater Vulnerability

The vulnerability rating for the site is based on the depth of overburden, which has varied over the years once backfilling commenced. The mapped groundwater vulnerability rating for the majority of the subject site is classified as 'High (H)' by the GSI. An area along the southern boundary of the site is mapped as 'Extreme (E)' and 'Rock at or near surface (X)'.
We will discuss current groundwater vulnerability again later on in this report.

2.6.4. Groundwater Resources

There are a number of water wells located within the site boundary. Well GW1, located near the site entrance from the R108, is intended as a water supply source for the office, canteen and toilet facilities within the site. At the time of the site inspection, the pump for this well was out of operation.

Well GW2, located in the south of the Clashford WRF site is used as a water source for the site sprinkler system and farmland area.

Please note that other wells on site (GW3, GW4, and GW5) are groundwater monitoring wells, and are not used for groundwater abstraction.

The GSI wells database identifies the closest well (with a high degree of accuracy) to the subject site as a public water supply borehole (2925NEW094) that is located ~1.1km east-northeast of the site. The location of this well is illustrated on **Figure F**.

3 no. other public water supply wells, with a lesser degree of locational accuracy in the GSI wells database, that are located further from the site are also indicated on **Figure G.** The Outer Protection Zone (OPZ) for public water supply well 2925NEW093 is within ~300m of the Clashford WRF site but is separated from the site by the Delvin River. As groundwater flows from the Clashford WRF site discharge to the Delvin River, groundwater from the site is not considered to be hydraulically connected to this OPZ.

The GSI database does not identify other private groundwater wells within 1km of the subject site.

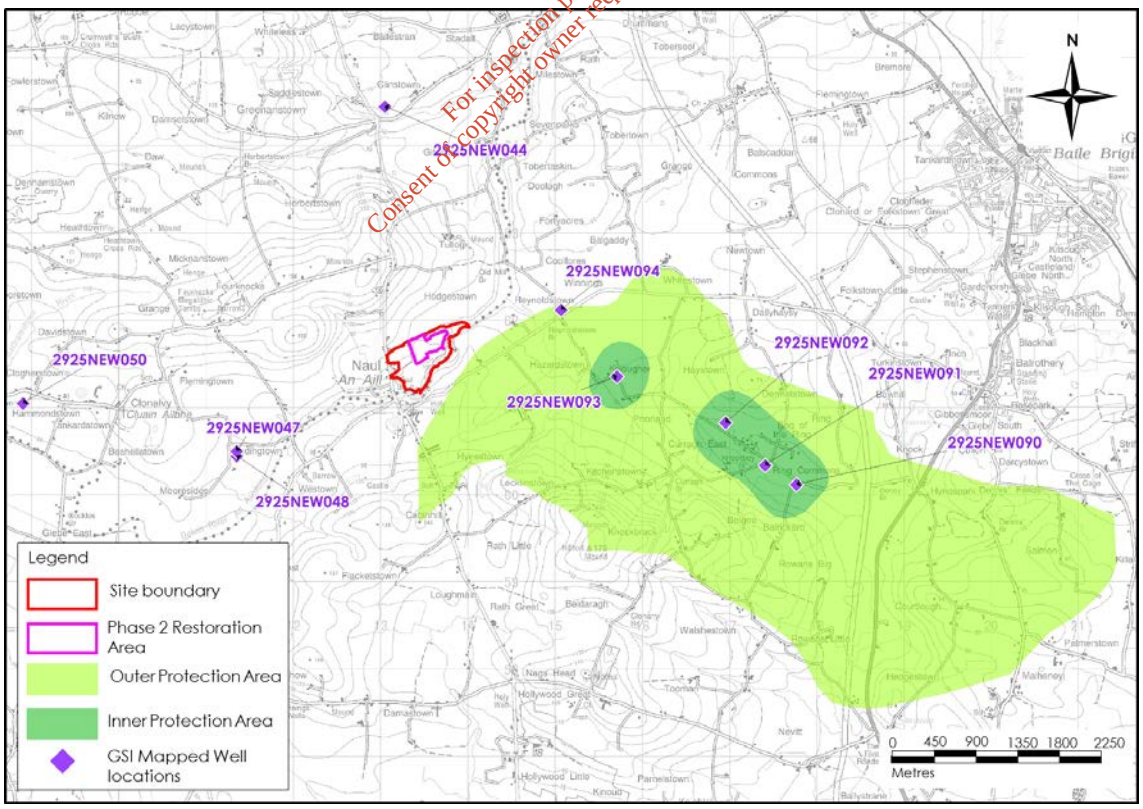


Figure F: Local groundwater well location map

2.6.5. Groundwater Body Status

GWB status is defined based on the quantitative status and chemical status of the GWB. Both the Duleek GWB and Lusk GWB which underlie the site are assigned "Good Status".

2.7. DESIGNATED SITES & HABITATS

Within the Republic of Ireland designated sites include National Heritage Areas (NHAs), Special Areas of Conservation (SAC) and Special Protection Areas (SPAs).

According to the National Parks and Wildlife Services (NPWS) map viewer (webgis.npws.ie/npwsviewer), the subject site is not in close proximity to the any NHA, SAC or SPA.

As outlined in correspondence from HES to the EPA on 18th March 2016[6], there are a number of Natura 2000 sites within 15km of the Clashford Facility, namely:

- River Nanny Estuary and Shore SPA (Site Code: 004158)
- Boyne Coast Estuary SAC (Site Code: 001957)
- Boyne Estuary SPA (Site Code: 004080)
- Rockabill to Dalkey Island (Site Code: 003000)
- Rockabill SPA (Site Code: 004014)
- Skerries Islands SPA (Site Code: 004122)
- Rogerstown Estuary SAC (Site Code: 000208)
- Rogerstown Estuary SPA (Site Code: 004015)
- Lambay Island SAC (Site Code: 000204)
- Lambay Island SPA (Site Code: 004069)

In this letter the lack of connectivity between the Natura 2000 sites and the Clashford sites is detailed:

> "*There is a considerable distance between the Clashford site and any of the Natura 2000 sites. For all Natura 2000 sites sediment or surface water has to travel in the river and then the sea to get to any of the Natura 2000 sites. The shortest flowpath is to the River Nanny Estuary and Shore SPA (Site Code: 004158), and this is some 10.5kms (including 1.5kms of open sea water). Assuming an average near shore sea depth of 5m, and using the near shore 500m width (as a likely flow path from the Delvin estuary towards the SPA), the volume of this near shore body of water is some 3,750,000m³ of sea water. The dilution available in the sea for any minor water quality issue in the Delvin River is significant and will buffer the SPA from any significant potential impact.*"

In the interest of clarity and completeness, we have attached the submitted letter as an Appendix to this report. (please see **Appendix I)**.

In summary, the distances involved and the dilution available imply that any discharges from the Clashford WRF site cannot concievably impact on these downstream designated sites.

[6] *P1317-0_001 Letter to Inspector Babiarczyk, Environmental Licencing Program, Office of Climate, Licencing, Resources & Research, EPA regarding Clashford Recovery Facility licence W0265-01*

3. ENVIRONMENTAL SITE INVESTIGATIONS AND MONITORING

3.1. INTRODUCTION

A comprehensive site investigation was carried out on the Clashford WRF site as part of this Environmental Assessment and Risk Assessment. The investigation consisted of the drilling of 6 no. boreholes; 18 no. test pits and taking of 22 no. soil samples; and the sampling of existing groundwater monitoring wells and surface water sampling of the Delvin River and its tributary.

Soil samples from the boreholes and trial pits, and water samples from the monitoring wells and surface water points, were all laboratory analysed to give an indication of the presence of pollutants in the environment at Clashford WRF, specifically in Phase 2 Restoration Area.

The aim of this site investigation was to complete the characterisation of the Clashford WRF site to allow a detailed risk assessment to be carried out. The site investigation allowed HES to determine the depth of imported fill currently within the site by reaching the underlying natural subsoil and bedrock and to characterize the composition of the fill and potential risks to groundwater and surface water if a pollution pathway exists between materials within the fill material and the receiving environment.

3.2. GROUNDWATER MONITORING

The Clashford WRF site contains 5 no. existing groundwater monitoring wells. Of these, 2 no. (GW1 and GW2) are used as water supply sources for onsite activities, and 3 no. (GW3, GW4, GW5) are dedicated groundwater monitoring wells. **Figure 1** illustrates the location of the wells. Monitoring well logs for GW3, GW4, and GW5 are attached in **Appendix II**. Please note that no drilling logs are available for GW1 or GW2, as these were drilled previously as supply wells, and were only subsequently used for monitoring purposes.

Previous groundwater sampling was completed in 2014 (August/September) and 2017 (12th September). These data are included in **Table 1** for comparison with 2018 data.

Groundwater samples were collected from these wells on 13th March 2018 and sent to the laboratory (Exova Jones Environmental) for analysis. An additional water sample from GW4 was taken on 01st May 2018. The results of these analyses are presented in **Table 1** and **Appendix III**.

The laboratory reports for previous groundwater sampling that was undertaken in 2017 is also presented in **Appendix III**.

Field hydrochemistry was recorded on site during groundwater sampling events. These data are presented in **Table A**.

Table A: Field Hydrochemistry Data - Groundwater

Well ID	Date	pH	Ec (µS/cm)	Temperature (°C)	Dissolved oxygen (DO %)
GW1	13/03/2018	8.2	553	10.0	70
GW2	13/03/2018	7.9	604	10.0	71
GW3	13/03/2018	7.4	1045	11.8	11.6
GW4	13/03/2018	7.4	1456	10.9	53
GW5	13/03/2018	7.7	620	10.8	15.9
GW4	01/05/2018	7.18	1967	11.32	30.4

Water levels were recorded in each monitoring well prior to sampling events. Reduced water levels are presented in Table B.

Table B: Summary of Groundwater Level Data

Well ID	Type	Water levels (mOD)				
		08/01/2009	11/08/2014	04/08/2017	12/09/2017	13/03/2018
GW1	6" supply well	68.45	67.27	67.25	67.30	67.63
GW2	6" supply well	54.37	54.19	52.50	52.70	53.56
GW3	Monitoring well	-	55.68	56.96	56.81	57.44
GW4	Monitoring well	-	44.55	43.90	43.95	44.56
GW5	Monitoring well	-	-	47.23	47.29	47.92

3.3. SURFACE WATER MONITORING

Surface water monitoring was undertaken at 5 no. locations as shown in **Figure 1**. Surface water samples were collected by HES in 2017 on behalf of Clashford Recovery Facility. These data are included as **Appendix III** of this report.

On 13th March 2018 a further round of surface water samples was collected and sent to an independent laboratory (Exova Jones Environmental) for analysis. The results are presented in **Table 2** and original laboratory reports are included in **Appendix III**.

Field hydrochemistry was recorded on site during the March 2018 surface water sampling event. These data are presented in **Table C**.

Table C: Field Hydrochemistry Data – Surface water

Well ID	Date	pH	Ec (µS/cm)	Temperature (°C)	Dissolved oxygen (DO %)
SW1	13/03/2018	7.9	707	6.7	101
SW2	13/03/2018	8.0	696	6.7	85
SW3	13/03/2018	8.03	670	5.8	101
SW4	13/03/2018	7.9	599	7.3	94
SW5	13/03/2018	7.9	570	7.3	94.8

3.4. TRIAL PITS

3.4.1. 2009 Trial Pits

13 no. trial pits were excavated at the Clashford WRF in 2009. The trial pits were logged by Dr. Robbie Meehan. Logs for the 2009 trial pits are attached in **Appendix IV**. A site investigation map showing locations of these trial pits is shown as **Figure 1**.

3.4.2. 2018 Trial Pits

18 no. trial pits were excavated at the site between 23rd April and 25th April 2018. A site investigation map showing locations of these trial pits is shown as **Figure 1**. 2018 trial pit logs are also attached as **Appendix IV**.

Soil samples from these 2018 trial pits were sent to a laboratory (Exova Jones Environmental) for independent analysis. The results of these soils analyses are presented in **Appendix V**.

3.5. BOREHOLE DRILLING

Drilling works were completed by Ground Investigation Ireland (GII). Mobilisation to site was undertaken on 23rd April 2018, and drilling works commenced on the same day, and all works were completed by 27th April 2018. The drilling was completed using a Dando Shell and Auger drilling rig.

Detailed drilling and environmental logs for the borehole are attached as **Appendix VI**. The locations of the completed boreholes are shown in **Figure 1**.

Sampling of the drill cuttings was undertaken during the drilling operations. A selection of composite soil samples from the borehole drilling works were sent to the laboratory (Exova

Jones Environmental) for analysis. The results of these soils analyses are presented in **Appendix V**.

3.6. SUMMARY OF WATER ANALYSIS RESULTS

3.6.1. Groundwater Quality

In 2018, groundwater sampling was conducted by HES on 13th March 2018 and 1st May 2018. These are discussed further below. Firstly, we will discuss the 2014 data.

3.6.1.1. Groundwater Quality Data - 2014

In 2014, groundwater samples were taken from GW1, GW2, GW3, and GW4. Sampling was completed in August and September 2014, and data are presented in the 2014 EIS. The following discussion relates to the 2014 groundwater data.

The ammoniacal nitrogen concentration in GW4 (1.4mg/L and 0.65mg/L) exceeded the GTV and Drinking Water Regulation limits at this time. All other wells were within the regulation limits. In 2018, GW1 and GW4 exceeded the ammonium drinking water guideline limits of 0.3mg/L with concentrations of 0.57mg/L and 1.3mg/L respectively.

Elevated concentrations of total phosphorous were detected in GW3 (460µg/L, 315µg/L) relative to the phosphorous concentration measured in the other wells.

The chloride concentrations in the two downgradient wells GW3 (110.1mg/L, 48.6mg/L) and GW4 (120.4mg/L, 127.9mg/L) were significantly elevated above the concentrations in the upgradient well GW1 (18.9mg/L). In 2018, high chloride levels were detected in GW3, GW4 and GW5 that exceeded the Groundwater Regulations (SI 9/2010) and the IGV thresholds.

A high dissolved potassium concentration was initially detected in GW4 (75.2mg/L) in August 2014. Upon resampling the concentration had receded to 5.2mg/L. Concentrations of sodium were significantly higher at GW4 (138.3mg/L, 70.1mg/L) than the other wells. In 2018, high potassium concentrations were detected in GW3 (7.8mg/L) and GW4 (6.5mg/L) which was above the Interim Guideline Values (IGV) of 5mg/L.

Nitrate and orthophosphate concentrations were at low levels in both the 2014 and 2018 sampling.

In 2014, faecal coliforms were detected in samples at both downstream wells GW3 and GW4 but not the upstream wells GW1 and GW2. However, none of the 2018 samples detected coliforms or faecal coliforms.

EC levels in August 2014 were lower in GW1 (458µS/cm), GW2 (629µS/cm) compared to the downstream wells GW3 (938µS/cm, 755µS/cm) and GW4 (1140µS/cm, 1245µS/cm). In 2018, EC was in the normal range, between 405 and 869µs/cm for each of the groundwater wells, with the exception of GW4 which had a conductivity of 1417µS/cm.

3.6.1.2. Groundwater Quality Data - 2017

All five on site wells were sampled on 12th September 2017. The following discussion relates to groundwater quality laboratory results from this date.

Total Alkalinity concentrations vary between 230mg/L and 398mg/L across all sampling locations and dates and they are representative of typically conditions at the site.

Ammoniacal Nitrogen exceeded the IGV limit in GW-4 (at 0.24mg/l), however the concentration is significantly reduced compared to the two samples taken in 2014(0.65-1.4mg/L) indicating an improvement in groundwater quality relative to the 2014 conditions.

Chloride concentrations for GW-3 (60.9mg/l), GW-4 (102.3mg/l) and GW-5 (51.3mg/l) exceed the IGV limit (30mg/l). Animal waste is a rich source of chloride and these concentration levels may indicate pollution related to slurry spreading. As discussed in Section 3, a likely source of elevated nitrogen and chloride is land spreading of organic fertilizer to aid in the revegetation process at the site. The highest chloride level detected continues to be in GW-4 but it has decreased from concentrations of 120.4mg/l and 127.9mg/l, measured in 2014, to its current concentration of 102.3mg/l.

All groundwater samples indicate the absence of any microbial pathogens or hydrocarbons in local groundwater which is an improvement on the 2014 environment where both total and faecal coliforms were detected in GW-3 and GW-4.

Manganese concentrations for all four samples exceeded the IGV limit (0.05mg/l), however manganese is a naturally occurring groundwater mineral and dissolves readily in groundwater in low dissolved oxygen conditions. It is consistently high at all locations and is therefore considered to be naturally occurring in local bedrock.

3.6.1.3. Groundwater Quality Data - 2018

All five on site wells were sampled on 13th March 2018, and GW4 was resampled on 1st May 2018. The following discussion relates to groundwater quality laboratory results from this date.

Total Alkalinity concentrations vary between 198mg/L and 430mg/L across all sampling locations and dates and they are representative of typically conditions at the site.

Ammoniacal Nitrogen exceeded the IGV limit in GW1 and GW-4 (at 0.57 and 1.3/1.99mg/l respectively). 2018 sampling appears to indicate similar ammonia values to what was recorded in 2014 in GW4. This may relate to ongoing landspreading and landscaping within the Clashford WRF site.

Chloride concentrations for GW-3 (67.5mg/l), GW-4 (223.2/210.4mg/l) and GW-5 (57.5mg/l) exceed the IGV limit (30mg/l). Animal waste is a rich source of chloride and these concentration levels may indicate pollution related to slurry spreading. As discussed above, a likely source of elevated nitrogen and chloride is land spreading of organic fertilizer to aid in the revegetation process at the site.

GW4 sample from 1st May indicates elevated total coliforms of 155.3 (MPN/100ml). This may be due to clay particles in the sample. All other groundwater samples from 2018 indicate the absence of any microbial pathogens or hydrocarbons in local groundwater which is an improvement on the 2014 environment where both total and faecal coliforms were detected in GW-3 and GW-4.

In 2018, iron and manganese concentrations exceeded Drinking Water Regulations (SI 122/2014) in GW1 (Manganese only), GW2, GW4 and GW5. Both 2014 and 2018 samples identified particularly high concentrations in GW4. These recorded values appear to relate to

natural background chemistry of the local bedrock. There may also be increased mineralisation due to local faulting mapped in the area of the Clashford WRF site.

GW4 contained elevated levels of arsenic (15.7µg/L) and barium (126µg/L) which were significantly higher than the levels in other wells and exceeded the relevant guidelines for these parameters. The concentrations are small, but as they are above the concentrations recorded for other sampling locations, their presence has been highlighted. The Drinking Water limit for arsenic is 10µg/L, so the exceedance is minor.

The barium concentration could be attributed to dissolution of the mineral Barite ($BaSO_4$), which is controlled by sulphate reducing bacteria. Again, the concentration is relatively small. Previous Drinking Water Regulation (S.I. 88 of 1988) values for Barium were 500µg/L. Also, WHO guidelines (WHO, 2004)[7] suggest a guideline value of 700 µg/L. As such, the recorded concentration at GW4 would be below both of these documented guideline values. The IGV value used in the screening process relates to A1 water (surface water) from the Surface Water Regulations (S.I. 294 of 1989)[8].

3.6.2. Surface Water

3.6.2.1. Surface Water Quality Data – 2014

Electrical conductivity ranged between 514 and 714 µS/cm. pH was recorded between 7.93 and 8.12. Ammonia concentrations were higher upstream of the Clashford WRF site than downstream, and BOD and Ortho-P concentrations were elevated.

3.6.2.2. Surface Water Quality Data – 2017

SW1-SW5 were sampled on 12th September 2017. The following discussion relates to surface water laboratory results from this date.

A lower EC was recorded in the surface water samples, between 491 and 638 µS/cm, compared to 559-938 µS/cm for groundwater, suggesting a higher content of dissolved ionic salts in the groundwater wells compared to the surface water.

The surface water pH level was recorded between 7.94 and 8.03 for all surface water sample locations.

Of note are the nitrogen-based parameters, which are not significantly elevated but do indicate a drop in water quality, particularly at monitoring points SW4A and SW5, relative to unpolluted watercourses. Typically, tillage, livestock or use of fertilisers are likely sources for a high nitrogen results (both organic and inorganic) and this is feasible given the location of the sampling points and the surrounding land uses. Faecal and total coliforms are also elevated in all samples.

Runoff for agricultural land can also be responsible for increased phosphate concentrations. Similarly, to the surface water nitrogen concentrations recorded, the total phosphate concentration is higher than unpolluted watercourses (0.13-0.06mg/L) but is likely to be a reflection of the agricultural land uses in the catchment.

3.6.2.3. Surface Water Quality Data – 2018

SW1-SW5 were sampled on 13th March 2018. The following discussion relates to surface water laboratory results from this date.

[7] *Barium in Drinking-water, Background document for development of WHO Guidelines for Drinking-water Quality (WHO, 2004).*
[8] *S.I. No. 294/1989 — European Communities (Quality of Surface Water Intended For The Abstraction of Drinking Water) Regulations, 1989.*

The analysis of surface water samples did not detect any significant levels of pollutants in the samples besides high coliform and orthophosphate concentrations, very similar to the 2017 data. However, high levels in these two parameters are not unexpected as the surrounding land use includes a large degree of agriculture and, with regards to samples on the Delvin River, the Naul WWTP is located immediately upstream of SW2.

3.7. SUMMARY OF 2018 SOIL ANALYSIS RESULTS

Soil sample results from the trial pits and boreholes indicated that the fill is relatively benign and generally inert material. Very small detections of asbestos were recorded in 2 of the 17 no. soils samples presented for asbestos screening analysis. These two samples contained <0.1% asbestos. Soil material from trial pit TP18-02 contained elevated levels of arsenic, cadmium, nickel and lead and had the highest (trial pit) level of extractable petroleum hydrocarbons (EPH at 396 mg/kg). Elevated EPH concentrations were also detected in BH02, BH03, BH04 and BH05, TP18-02, TP18-16 and TP18-17. However, overall these detections are relatively minor in nature, and do not pose a risk to groundwater or the receiving environment.

Slightly elevated polycyclic aromatic hydrocarbons (PAHs between 0.27 and 10.66 mg/kg) were detected in BH02, BH03, BH04, and BH6 and TP18-09 (2.0-3.0m), TP18-09(0.5-2.0m), TP18-06, TP18-18, TP18-12 and TP18-13. However, overall these detections are relatively minor in nature, and do not pose a risk to groundwater or the receiving environment. They may relate to small quantities of tarmac and/or ash material contained within the imported fill.

6 no. boreholes were sampled at various depths and the sampling results demonstrate that parameter concentrations are generally low, and similar to those encountered in trial pit samples. The extractable petroleum hydrocarbons (EPH) concentration was slightly elevated in each of the borehole samples tested. However, overall these detections are relatively minor in nature, and do not pose a risk to groundwater or the receiving environment. They may relate to small quantities of tarmac material contained within the imported fill, and [at the concentrations recorded] do not indicate gross contamination by diesel/petrol or other petroleum based hydrocarbons.

Elevated PAHs were detected in BH02, BH03-1, BH03-2, BH04-2 and BH06. In terms of metals, several samples exceeded the draft soil trigger levels[9] but recorded concentrations were very low.

There were very low detections of sVOC, and PCBs in some soil samples, and no detections of phenols noted. Again, overall these are of a relatively minor nature, and do not pose a risk to groundwater or the receiving environment.

12 no. soil samples were tested for the Murphy Suite. A summary of compliance with WAC (Waste Acceptance Criteria) for this licenced facility is provided in

[9] *Taken from table 3.3: Summary of Soil Trigger Levels for Soil Recovery Facilities, from Waste Acceptance Criteria and Development of Soil Trigger Values for EPA-Licenced Soil Recovery Facilities (EPA, December 2017) - Draft for Consultation.*

Table D. This summary illustrates that the majority of the samples tested meet the WAC for Murphy Inert Landfill (Licence No. W0129-02). There are a small number of exceedances for fluoride, sulphate and TDS. The elevated sulphate (and associated TDS) may be related to imported marine sediments, gypsum, or sulphate reducing bacteria. One of the samples with elevated sulphate is from natural ground below the imported fill material (sample BH04-8.5m).

Table D: Summary of soils analysis data relative to WAC for MEHL (Waste Licence W0129-02)

Parameter	MEHL WAC Limit (mg/kg)	No. Samples tested	Min. Result (mg/kg)	Max. Result (mg/kg)	No. of non-compliance with WAC	% Compliance with WAC
Arsenic	**0.5**	12	<0.025	0.102	0	100%
Barium	**20**	12	0.07	0.61	0	100%
Cadmium)	**0.04**	12	<0.005	<0.005	0	100%
Chromium	**0.5**	12	<0.015	0.02	0	100%
Copper	**2**	12	<0.07	0.13	0	100%
Lead	**0.5**	12	<0.05	<0.05	0	100%
Molybdenum	**0.5**	12	0.09	0.32	0	100%
Nickel	**0.4**	12	<0.02	0.05	0	100%
Selenium	**0.1**	12	<0.03	0.09	0	100%
Zinc	**4**	12	<0.03	<0.03	0	100%
Mercury	**0.01**	12	<0.0001	0.0003	0	100%
Phenol	**1**	12	<0.1	0	0	100%
Fluoride	**10**	12	<3	282	2	83.3%
Sulphate	**1000**	12	102.3	3167.8	4	66.7%
Chloride	**800**	12	5	181	0	100%
DOC	**500**	12	30	110	0	100%
TDS	**4000**	12	1280	5769	2	83.3%

4. ENVIRONMENTAL CHARACTERISATION

4.1. SUBSOIL AND BEDROCK GEOLOGY AT THE SITE

Site investigation work carried out on the subject site allows for a more accurate and up to date understanding of the site's subsoil geology in comparison to desk study information.

A soil and subsoil assessment was carried out at the Clashford site by Dr. Robert Meehan on behalf of JSPE on 6th January and 21st January 2009. This investigation included 13 no. trial pits excavated to a depth ranging from 2.12m to 2.8m below ground level. This investigation found topsoil depths varied between 0 to 0.6m. Regarding subsoils, the 2009 investigation recorded all areas of the site to contain unmottled SILT/CLAY fill of varying stiffness, and in the northeastern area of the overall site the subsoil material was found to be heavily consolidated, either naturally stiff prior to placement or they had been over-compacted.

The drilling log for GW3 (see **Appendix II**) indicates a depth of backfill of 5.0m. 0.5m of sand and 9.5m of clay material underlay the backfill material. At 14mbgl, weathered Siltstone was encountered, and at 18mbgl limestone bedrock was recorded. The total depth of the well is 31.5m.

The drilling log for GW4 (see **Appendix II**) shows that backfill material was not detected at this location. A thin layer of topsoil was underlain by a SILT/CLAY to 6.8mbgl and this was underlain by limestone bedrock from 6.80 to 24.5 mbgl. The total depth of the well is 24.5m.

The drilling log for GW5 (see **Appendix II**) shows that clay was recorded to 11.5mbgl, and this was underlain by siltstone bedrock from 11.5 to 30.48mbgl. The total depth of the well is 30.48m.

Site investigations completed in 2018 (trial pits and boreholes), undertaken by HES, has identified soils and subsoils consistent with those encountered during the 2009 investigation. Imported soils are generally dry, grey brown, and comprise mainly stiff boulder Clay. Natural ground was encountered below the fill material in boreholes BH03, and BH04, and BH05.

4.2. SUMMARY OF THE NATURE AND EXTENT OF FILL MATERIAL IN PHASE 2 AREA OF CLASHFORD RECOVERY FACILITY

The 2009 and 2018 site investigation works are relatively similar and allow a detailed description of the fill material to be made.

Imported soils are generally dry, grey brown, and comprise mainly stiff boulder CLAY and SILT. The material excavated is similar in nature to glacial deposits found in County Meath and north County Dublin.

There is a small percentage of C&D material in the imported fill, and this mainly comprises concrete and plastic, and some builders materials. Broken concrete gravels and gravel fill were generally found close to on site access roads. This type of material appears to have been used to make up the site roads as fill progressed.

Depths of imported fill were found to vary between 4 and 8.5mbgl in Phase 2 Restoration Area. The original ground contours in Phase 2 prior to filling were between 62 and 71 mOD. Current ground levels are between 71 and 77 mOD. The total volume of fill is ~452,000 m^3.

In general, the soil results from the site investigation indicate that the fill is almost exclusively composed of inert material and that there are low concentrations of metals and organic contaminants within the fill material.

4.3. SUMMARY OF SITE HYDROGEOLOGY

Based on observations from all site investigation works the fill material at the site is dry and is above the local groundwater table.

Groundwater levels (from the underlying bedrock aquifer) have been recorded at each monitoring well prior to water sampling (*c.f.* **Table B**). Water levels taken before sampling in May 2018 have been used to draw a groundwater contour map for the site (refer to **Figure G**). These data indicate groundwater flow at the site is to the east-southeast towards the Delvin River. Groundwater gradient is low at 0.054. Groundwater level recorded during 2017 and 2018 are similar to those reported in 2009 and 2014.

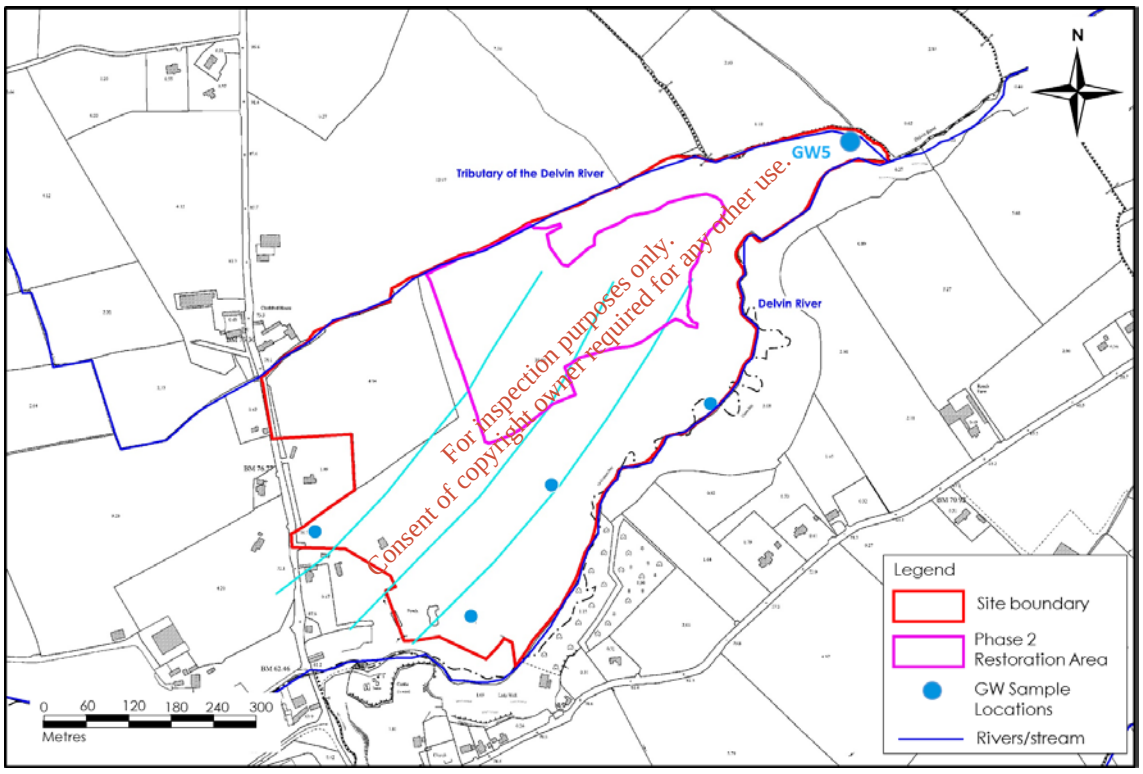


Figure G: Groundwater Contour Plan from 13/03/2018

In general, the fill material comprises low permeability glacial material (till and boulder clays). Our estimates of bulk permeability (based on visual observation) is in the order 10^{-7} to 10^{-8} m/s. Therefore, recharge through the fill material is likely to be moderate to low with the majority of rainwater being held in the topsoil cover material or running off as surface water flow. Higher localized permeabilities are expected in areas where fill comprises more percentage concrete, *e.g.* below site access roads. However, these linear zones are likely to be isolated by lower permeability fill which occurs on both sides of the site access roads.

The natural deposits below the fill material are likely to be a range of glacial materials and may be saturated and permeable enough to allow groundwater flow, which is likely to occur laterally towards the Delvin River.

Overall, the water quality in the 5 no. groundwater wells was of reasonable standard and indicated a low contaminant concentration for most parameters.

5. GENERIC QUANTITATIVE RISK ASSESSMENT

5.1. CONCEPTUAL SITE MODEL AND RISK ASSESSMENT

Based on information contained within the previous sections, and also using all historical and desk-based data, a conceptual site model (CSM) has been developed for the Phase 2 Restoration Area of the Clashford WRF site. This CSM is presented as **Figure 2.** The CSM is summarised as follows:

- The soil/subsoils underlying the site are described as Glaciofluvial Sands and Gravels. In the Delvin River valley, the subsoils are recognized to be Undifferentiated Alluvium. The natural subsoils at the site have been removed, and imported material form the build-up of the site geology to current ground levels. The imported fill material comprises glacial clays and silts from County Meath and North County Dublin, and range between black boulder clay and brown glacial tills. There is a small amount of C&D material mixed in with the imported fill material, and there appears to be an increase in concrete fill under site access roads.
- The fill material is comprised of low permeability glacial material (tills and boulder clays). Our estimates of bulk permeability (based on visual observation) is in the order 10^{-7} to 10^{-8} m/s. Higher localized permeabilities ae expected in isolated areas where fill comprises more percentage gravel/concrete, *e.g.* below site roads.
- The imported fill material in Phase 2 Restoration Area is 4-8.5m in depth. The total volume of fill is ~452,000m^3.
- Based on the previous site investigation data and additional 2018 site investigation data, the site is predominately underlain by silt/clay, over predominantly brown mudstone and siltstone bedrock which is classified as a Poor bedrock aquifer. A southern section of the site near GW2 is underlain by mudbank limestone, classified as a Locally Important aquifer. As mentioned above, alluvial deposits are located on the southern boundary of the property where the Delvin River flows.
- In the Phase 2 Restoration Area groundwater and surface water flow directions would appear to be opposite, with surface water flow towards the tributary of the Delvin River located northwest of the site. The groundwater flow appears to follow the direction of the bedrock layer orientation with an east-southeast gradient (gradient = 0.054).
- Recharge through the fill material is likely to be moderate to low with the majority of rainwater being held in the topsoil cover material or running off to local watercourses (tributary to the northwest, or directly to the Delvin River depending on local topography) as surface water flow. Surface water from the majority of the Phase 2 Restoration Area flows via the existing settlement ponds and discharges to the tributary of the Delvin River that forms the northwestern boundary of the Clashford WRF site.
- The main contaminant source of concern for groundwater and surface water is the deposited fill material within the Phase 2 Restoration Areas, and the possibility of resultant leachate entering the underlying groundwater system. A secondary contaminant source is surface water runoff contaminated by surface particles within the Phase 2 Restoration Area. A third source is the potential for spills or leaks from fuels and chemicals stored/used within the Clashford WRF site.
- A Local Authority/Irish Water groundwater abstraction well and OPZ (outer protection zone) is identified to the east of the Clashford site but the site itself is not within the OPZ. The natural groundwater flows are to the Delvin River, which flows between the

site and the OPZ. Groundwater within the site is not hydraulically connected to the mapped OPZ.

5.2. SOURCE – PATHWAY - RECEPTOR

Defining the conceptual model requires identification of all potential sources, pathways and receptors of contamination and identifying plausible combinations of these three components. Potentially significant pollutant linkages can then be qualitatively or quantitatively assessed to identify potential risks.

No significant source of contamination was found during this assessment. This statement is supported by the site investigation works, soils analysis and groundwater analysis completed at the site.

Listed below are all the potential minor sources of contamination that were noted this assessment, along with the main potential pathways and receptors. These notes should be read in conjunction with the CSM diagram presented in **Figure 2**.

5.2.1. Source

The main sources of potential contamination identified at the site are:

- Leakages and spillages of fuels and chemicals stored on the site or used in machinery and trucks during backfill of the site;
- Leaching to groundwater from the infilled deposition areas; and
- Material with pollution potential on site surfaces *e.g.* sediment, and subsequent entrainment in site runoff during rainfall events.

5.2.2. Pathway

The pathways by which the contamination could reach potential receptors are described below:

- Surface water runoff and on-site surface water drainage pathways; and,
- Vertical and lateral migration via groundwater flow paths.

5.2.3. Receptors

The following potential receptors were identified:

- Local surface water courses *i.e.* Delvin River and its tributary;
- The underlying bedrock aquifer; and,
- The County Council water supply wells.

5.3. ENVIRONMENTAL ASSESSMENT SUMMARY

While there are several small water quality issues with the existing groundwater quality dataset, the available data indicates that this may be more related to manure spreading on the site post restoration than, actual leaching from the imported fill material. There are also some minor exceedances with water quality at GW4 (discussed above), and while this well is not located in Phase 2 Restoration Aarea, it is also not located near any previously filled area.

There is no apparent or evident significant indictors in the reported soils data, or groundwater quality data, that identifies the Phase 2 Restoration Area, or indeed the entire Clashford WRF site as a major source of groundwater or surface water contamination locally.

Deep groundwater flow beneath the site (beneath the fill material) is likely to occur from a northwest to east-southeast direction towards the Delvin River and this is restricted/slowed down by the low permeability of the overlying imported fill material (boulder clay/till). The imported boulder clay/till cover over the regionally important aquifer will provide a degree of protection to the underlying aquifer, thus reducing the vulnerability rating for the aquifer below the site.

Groundwater quality data from wells within the site show no evidence of organic contamination. In addition soil and soil eluate laboratory test results also indicate no significant contamination is expected from recharge and any resulting leachate. There are minor detections of organic parameters, but nothing that causes major concerns.

Based on the above assessment and all available soils, leachate and groundwater quality dataset, the risk posed to current or future site operatives at the Clashford WRF site or to the environment based on the current and proposed site use as a waste recovery facility is considered to be low.

The risk from the Clashford WRF site to the County Council/Irish Water public supply wells is also considered to be low due to a combination of the distance to the wells, and the short groundwater flow paths which are likely to end at the Delvin River.

6. REPORT CONCLUSIONS

6.1. CONCLUSIONS

- Various historic phases of site investigation (2009, 2014 and 2017) have been completed at the site. Previous studies related to the entire site and comprised trial pitting and drilling of groundwater monitoring wells;
- Site investigations in 2018, undertaken by HES, has identified soils and subsoils consistent with those encountered during the 2009, 2014 and 2017 investigations. Imported soils/subsoils are generally dry, grey brown, and comprise mainly stiff boulder clays and glacial tills. Natural (underlying) ground was encountered below the fill material in boreholes BH03, and BH04, and BH05. The imported fill material is similar in nature to glacial deposits found in County Meath and north County Dublin;
- There is a small percentage of C&D material in the imported fill, and this mainly comprises concrete and plastic, and some builders materials. Broken concrete gravels and gravel fill were generally found close to on site access roads. This type of material appears to have been used to make up the site roads as fill progressed;
- Depths of imported fill varies between 4 and 8.5mbgl in Phase 2 Restoration Area. The original ground contours in Phase 2 prior to filling were between 62 and 71 mOD. Current ground levels are between 71 and 77 mOD. The total volume of imported fill is 452,000m^3;
- 2018 laboratory analysis of groundwater did not detect any significant levels of pollutants in the groundwater samples taken at the Clashford WRF site. However, elevated levels of iron, manganese, arsenic, barium, chloride, potassium and ammonium were recorded. The detections of iron, manganese, and ammonia are attributed to natural background conditions underlying the site. A likely source of elevated nitrogen, potassium and chloride is land spreading of organic fertilizer to aid in the revegetation process at the site. The other detections (arsenic and barium) are considered to be minor exceedances.
- 2018 laboratory analysis of surface water did not detect any significant levels of pollutants in the samples besides high coliform and othophosphate concentrations. However, these are not unexpected in an area of agricultural land use and with the presence of the Naul WWTP in close proximity to the site;
- A CSM (conceptual site model) was developed for the site and based on historic groundwater level data, the groundwater gradient in the underlying bedrock is in east-souteast direction. Groundwater flow in the upper section of the bedrock aquifer is expected to discharge into the Delvin River locally;
- The main sources of potential contamination identified included leakage and spillage of fuels and chemicals, leaching to groundwater from the infill deposition areas and material with pollution potential on site surfaces such as loose sediment. The pathways by which the contamination could reach potential receptors include surface water runoff and on-site drainage pathways and lateral and vertical migration via groundwater flow paths. The potential receptors included local surface water courses, the underlying bedrock aquifers and the County Council/Irish Water groundwater supply wells;
- The potential on-site sources of contamination identified are not significant and the environmental risk posed to the identified receptors by these sources is considered to be low. Controls such as appropraite bunding and an effective environmental management plan, typically conditioned under a waste licence, will effectively manage the risks posed to groundwater and surface at the site;

- While there are several small water quality issues with the existing groundwater quality dataset, overall the available data (soils, leachate, groundwater and surface water data) indicates that there is no apparent significant indictor that identifies the existing Clashford site as a major source of groundwater contamination locally;
- A Local Authority/Irish Water groundwater abstraction well is located to the east of the Clashford site, although the site is not mapped within the OPZ of the source. There is no risk posed to this OPZ from the Clashford WRF facility, as they are hydraulically discconnected on opposites side of the Delvin River;
- Based on the available environmental data, there has been no significant impact on the environment from the imported fill within Phase 2 Restoration Area or from the overall Clashford WRF site. Similarly, the expansion of the site through the importation of stone and sand based fill material will not have a significant effect as they are composed of inert material that will not produce a contaminant leachate;
- There is a considerable distance between Phase 2 Restoration Area of the Clashford WRF site and any of the Natura 2000 sites. The same can be said for the entire Clashford WRF. For all Natura 2000 sites sediment or surface water has to travel in the river and then the sea to get to any of the Natura 2000 sites. The shortest flowpath is to the River Nanny Estuary and Shore SPA (Site Code: 004158), and this is some 10.5kms (including 1.5kms of open sea water). The distances involved and the dilution available imply that any discharges from the Clashford WRF cannot concievably impact on these downstream designated sites; and,
- Based on all available environmental data, the overall risk to groundwater and surface water from the fill located in Phase 2 Restoration Area is low and the will not affect the status of the local surface water bodies (Delvin River and tributary) and groundwater bodies (Duleek GWB and Lusk GWB).

* * * * * * * * * * * * * * *

7. REFERENCES

Author	Year	Title
Environmental Protection Agency (EPA)	2014	Guidance on assessing and costing environmental liabilities
EPA	2017	Hydrology Data, www.epa.ie
Geological Survey Ireland (GSI)	2003	Bedrock Geology 1:100,000 Scale Map Series, Sheet 13 (Geology of Meath)
JSPE Ltd	2014	Environmental Impact Statement
JSPE Ltd	2009	Clashford Recovery Facility, Waste Management Licence Application

FIGURES

N

NOTE: ALL 2017 AND 2018 SURFACE WATER SAMPLING COMPLETED AT SW4A, WHICH IS UPSTREAM OF CURRENT DL-1

SW5 SW4 SW4A DL-1 SW3

GW5 GW4 GW3 GW2 GW1

SW2 SW1

TP-01 TP-02 TP-03 TP-04 TP-05 TP-06 TP-07 TP-08 TP-09 TP-10 TP-11 TP-12 TP-13

TPI8-01 TPI8-02 TPI8-03 TPI8-04 TPI8-05 TPI8-06 TPI8-07 TPI8-08 TPI8-09 TPI8-10 TPI8-11 TPI8-12 TPI8-13 TPI8-14 TPI8-15 TPI8-16 TPI8-17 TPI8-18

BHI8-01 BHI8-02 BHI8-03 BHI8-04 BHI8-05 BHI8-06

Clashford House

Ponds

BM 73.30 BM 76.77 BM 62.46

73.11

CV EP

0 30 60 90 120 150

Metres

LEGEND

- Site Boundary
- Phase 2 Restoration area
- Rivers
- TPI8-02 HES APR 2018 TP Locations
- BHI8-02 HES APR 2018 BH Locations
- TP-07 Trial Pits 2009
- GW2 GW Sampling locations 2018
- SW2 SW Sampling locations 2018
- 74.37 Ground Elevation (Mod)

KEY PLAN

Date	Description	Chkd	Signed
Revisions			

HYDRO ENVIRONMENTAL SERVICES
22 Lower Main St
Dungarvan
Co.Waterford
Ireland
tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Client: CLASHFORD WASTE RECOVERY FACILITY

Job: ENVIRONMENTAL ASSESSMENT

Title: SITE INVESTIGATION LOCATIONS

Figure No: FIGURE 1

Drawing No: P1317-2-0618-A3-FIGURE1-00A	
Sheet Size: A3	Project No.: P1317-2
Scale: 1:3,000 (A3)	Drawn By: MGill
Date: 20/06/2018	Checked By: MG

N S

Legend

- Pre fill G/L from 2009
- Final G/L
- Inert Fill
- Sand & Gravel
- Bedrock

Sources

1. Recharge through Inert Fill material
2. Agricultural land uses
3. Naul wastewater treatment plant discharge

Pathways

A. Recharge into underlying Aquifer

B. Runoff from fill surface

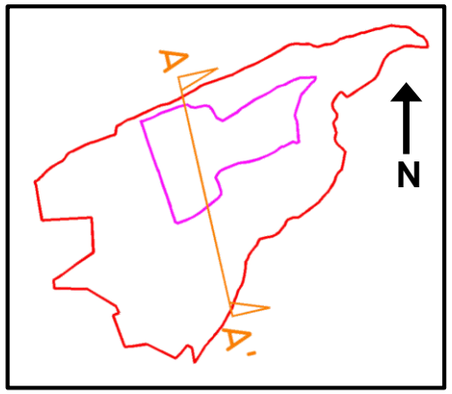
Receptors

X. Underlying Sand & Gravel & Bedrock Aquifer

Y. Delvin River

Z. Delvin River tributary

* Please note this drawing shows i**ndicative** geological horizons.



Key Plan

Figure 2 - CSM of Clashford WRF Site

TABLES

Table 1
Clashford Waste Recovery Facility, The Naul, Co. Meath
Summary of 2014, 2017 and 2018 Groundwater Quality Data

Sample Date	Units	GW2	GW3	GW4	GW3	GW4	GW2	GW3	GW4	GW5	GW1	GW2	GW3	GW4	GW4	GW5	Drinking Water Regs (S.I. 122 of 2014)	Groundwater Regs (S.I. 9 of 2010)	EPA Interim Guideline Values*
Date		05/08/2014	11/08/2014	05/08/2014	10/09/2014	10/09/2014	12/09/2017	12/09/2017	12/09/2017	12/09/2017	13/03/2018	13/03/2018	13/03/2018	13/03/2018	01/05/2018	13/03/2018			
Parameters																			
Total Alkalinity (as CaCO3)	mg/l	278	270	230	280	398	286	292	372	310	198	248	216	368	430	220	-	-	NAC
Ammoniacal Nitrogen (as NH4)	mg/l	0.08	<0.03	***1.4***	<0.03	***0.65***	0.06	<0.03	***0.24***	0.08	***0.57***	0.05	<0.03	***1.3***	***1.99***	0.06	0.3	0.175	0.15
Dissolved Calcium	mg/l	90.7	119.1	109.3	102.2	169.1	78.1	130.4	147.2	101	48.3	77.6	114.6	180.5	191.4	64.3	-	-	200
Chloride	mg/l	25	**110.1**	**120.4**	**48.6**	**127.9**	27.4	**60.9**	**102.3**	**51.3**	18	26.1	**67.5**	***223.2***	***210.4***	**57.5**	250	187.5	30
Conductivity	uS/cm	629	938	**1140**	755	**1245**	559	877	938	-	405	580	869	**1417**	**1313**	507	2500	1875	1000
Dissolved Iron	mg/l	0.028	<0.020	0.154	<0.02	**1.981**	0.188	<0.02	**4.157**	<0.02	0.035	**0.559**	<0.020	**5.224**	**6.015**	**0.201**	0.2	-	0.2
Lead	mg/l	-	-	-	-	-	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.01	0.01875	0.01
Magnesium	mg/l	22.9	30.7	19.5	23.6	22	19.2	30.1	17.7	17.4	13.4	19.9	29.8	30.9	28.4	16.9	-	-	50
Manganese	mg/l	**0.455**	**0.104**	**0.937**	**0.05**	**2.683**	**0.395**	**0.064**	**2.219**	**0.052**	**0.501**	**0.396**	0.049	**2.273**	**2.914**	**0.129**	0.05	-	0.05
Nitrate	mg/l	0.7	0.2	0.4	1.3	<0.2	<0.2	<0.2	2	0.5	<0.2	<0.2	1	<0.2	0.3	<0.2	50	37.5	25
Nitrite	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.04	**0.15**	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.5	0.375	0.2
pH		7.72	7.62	**10.64**	7.7	7.46	-	-	-	-									>=6.5 and <=9.5
Ortho Phosphate as PO4	mg/l	<0.06	<0.06	<0.06	<0.06	<0.06	<0.03	<0.03	<0.03	**0.06**	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	-	-	0.03
Total Phosphorus	µg/l	34	460	54	315	97	-	-	-	-	35	21	44	208	272	119	-	-	-
Dissolved Potassium	mg/l	1.9	**9.9**	**75.2**	**7.5**	5.2	1.5	**8.3**	3.1	3.7	2.7	1.6	**7.8**	**6.5**	1.4	2	-	-	5
Dissolved Sodium	mg/l	20.2	26.6	94.8	21.3	70.1	18.7	23.6	35	28	18.5	18.3	28.2	74.3	76.8	20.7	200	150	150
Sulphate	mg/l	73.97	90.82	138.27	84.88	70.39	48.6	177.4	36	44.7	16.3	48	110.6	35.7	38.6	23.5	250	187.5	200
Turbidity	NTU	0.3	0.5	0.5	0.9	1.1	1.4	1.9	3.9	0.8	33.3	4.8	6.7	76.1	80.8	149	-	-	-
EPH (C8 - C40)	µg/l	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	-	-	-
C8 - C40 Mineral Oil	µg/l	<10	<10	<10	<10	<10	<10	<10	<10	<10	n/a						-	-	-
Faecal Coliforms	cfu/100ml	0	**>100**	**20**	**10**	**30**	0	0	0	0	0	0	0	0	-	0	0	-	0
Total Coliforms	ctu/100ml	**3**	**>100**	**600**	**40**	**97**	0	0	0	0	0	0	0	0	155.3	0	0	-	0
Arsenic	µg/L										2.7	7.1	2.9	***15.7***	***16.7***	<2.5	10	7.5	10
Barium	µg/L										20	45	41	**126**	**184**	49	-	-	100
BOD	mg/L										2	<1	<1	<2	<2	2	-	-	-
Boron	mg/L										<0.012	<0.012	0.025	0.021	44	0.014	1	0.75	1
Cadmium	µg/L										<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	5	3.75	5
Chromium	µg/L										<1.5	<1.5	<1.5	<1.5	2.4	<1.5	50	37.7	30
E. coli	MPN/100ml										-	-	-	-	<1.0	-	-	-	-
Copper	mg/L										<7	<7	<7	<7	<7	<7	2	1.5	0.03
Nickel	µg/L										<2	<2	<2	<2	<2	<2	20	15	20
Nitrogen (Total Oxidised)	mg/L as N										<0.2	<0.2	0.2	<0.2	<0.2	<0.2	-	-	-
Silver	µg/L										<5	<5	<5	<5	<5	<5	-	-	-
TOC	mg/L										<2	<2	3	10	8	<2	-	-	NAC
Total Cations	mmolc/l										4.39	6.35	9.6	14.95	-	5.55	-	-	-
Total Anions	mmolc/l										4.81	6.69	8.54	14.4	-	6.51	-	-	-
Zinc (Dissolved)	µg/L										<3	<3	<3	<3	4	<3	-	-	-

* Towards Setting Guideline Values for the Protection of Groundwater in Ireland - Interim Report (EPA, 2003)
NAC - No abnormal change
Bold - exceeds IGV value
Bold and italics - exceeds GW Regs (SI 9 of 2010) TV value
Bold Underlined - exceeds Drinking Water Reg (SI 122 of 2014) paramter value

Table 2
Clashford Waste Recovery Facility, The Naul, Co. Meath
Summary of 2009, 2017 and 2018 Surface Water Quality Data

Sample Date	Upstream	Discharge	Downstream	SW1	SW2	SW3	SW4	SW5	SW1	SW2	SW3	SW4	SW5	EQS - Surface Water mg/l	Water Guidelines		
															2009 SW Regs AA (mg/l)	2009 SW Regs MAC (mg/l)	Salmonid water regulations SI 293/1988
	13/01/2009	13/01/2009	13/01/2009	12/09/2017	12/09/2017	12/09/2017	12/09/2017	12/09/2017	13/03/2018	13/03/2018	13/03/2018	13/03/2018	13/03/2018				
Parameters																	
Alkalinity (mg/l)	220	165	220	332	324	330	256	268	290	298	292	184	162	-	-	-	-
Ammoniacal Nitrogen as N (mg/l)	<0.08	**0.31**	<0.08	**0.04**	**0.16**	**0.05**	**0.05**	**0.05**	0.07	0.08	0.08	0.09	0.09	0.04	0.04	0.09	1
Arsenic (mg/l)	0.001	0.0051	0.0015	<0.0025	<0.0025	<0.0025	<0.0025	0.0026	3.4	4.1	5.3	2.9	4	0.025	0.025	-	-
Barium (mg/l)	0.034	0.037	0.034	0.031	0.031	0.019	0.028	0.029	40	37	37	29	30	-	-	-	-
Boron (mg/l)	0.05	0.06	0.05	0.046	0.039	0.039	0.021	0.024	0.023	0.017	<0.012	<0.012	<0.012	-	-	-	-
Cadmium(mg/l)	0.00027	0.00028	<0.0001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.5	<0.5	<0.5	<0.5	0.00008	0.00008	0.0002	-
Calcium (mg/l)	94	109	96	118.2	116.5	118.1	86.5	87.6	111.1	111.9	110.8	78.5	88.8	-	-	-	-
Chloride (mg/l)	31	64	34	27.1	27.9	27.8	28.5	28.4	29.3	30.4	29.7	32.6	34.1	-	-	-	0.005
Chromium (mg/l)	<0.001	0.019	<0.001	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<1.5	<1.5	<1.5	<1.5	<1.5	0.034	0.034	-	-
Conductivity (µS/cm @ 20'C)	506	692	529	638	610	627	491	505	661	674	658	515	541	-	-	-	-
Copper (mg/l)	<0.05	<0.05	<0.05	<0.007	<0.007	<0.007	<0.007	<0.007	<7	<7	<7	<7	<7	0.03	0.03	-	-
Cyanide (mg/l)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.01	-	-
Dissolved Oxygen	11.5	11.3	11.7	9	10	10	10	10	11	11	11	11	11	-	-	-	50% or ≥9(mg/L)
Fluoride	<0.1	0.25	<0.1	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	0.5	0.5	-	-
Iron#	0.18	0.37	0.23	0.052	0.027	0.027	0.039	0.04	<20	<20	<20	24	<20	-	-	-	-
Lead(mg/l)	<0.002	0.004	<0.002	<0.005	<0.005	<0.005	<0.005	<0.005	<5	<5	<5	<5	<5	0.0072	0.0072	-	-
Magnesium (mg/l)	8	10	8	9.6	9.9	10.2	8.9	8.9	7.9	8	7.8	7.3	8.2	-	-	-	-
Manganese#	0.06	0.08	0.06	0.049	0.039	0.024	0.053	0.054	35	38	44	64	55	-	-	-	-
Mercury (mg/l)	<0.00005	<0.00005	<0.00005	<0.001	<0.001	<0.001	<0.001	<0.001	<1	<1	<1	<1	<1	0.00005	0.00005	0.00007	-
Nickel#	<0.10	<0.10	<0.10	<0.002	<0.002	<0.002	<0.002	<0.002	<2	<2	<2	<2	<2	0.02	0.02	-	-
Nitrate as NO3 (mg/l)	25	2	23	5.4	4.8	4.7	14.5	14.4	14.2	14	13.5	21.7	21.3	-	-	-	-
Nitrite as NO2 (mg/l)	<0.2	<0.2	<0.2	<0.02	**0.06**	**0.06**	<0.02	<0.02	0.11	0.12	0.14	0.1	0.1	0.05	-	-	0.05
pH	7.9	7.8	7.9	7.96	8	7.94	8.03	8	7.73	7.8	7.84	7.51	7.44	6-9	-	-	6-9
Phosphate (low Level), ortho	**0.08**	**0.11**	**0.1**	**0.21**	**0.33**	**0.32**	**0.13**	**0.13**	**0.1**	**0.13**	**0.13**	**0.08**	**0.09**	-	Good status ≤0.035 (mean) or ≤0.075 (95%ile)	-	-
Phosphorus (mg/l)	0.09	0.27	0.07	**0.091**	**0.131**	**0.126**	**0.063**	**0.057**	-	-	-	-	-	0.025	0.045	0.025	-
Potassium (mg/l)	2	7	3	4	4.5	4.4	3.2	3.2	2.2	2.2	2.4	2.6	3.5	-	-	-	-
Residue on Evaporation @ 180'C	340	508	318	406	405	412	326	317						-	-	-	-
Selenium(mg/l)	0.0015	0.002	0.0016	<0.003	<0.003	<0.003	<0.003	<0.003	<3	<3	<3	<3	<3	-	-	-	-
Silver	<0.01	0.02	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<5	<5	<5	<5	<5	-	-	-	-
Sodium	14	44	17	12.2	13.8	14	14.7	14.9	12.4	12.4	12.4	12.6	14.6	-	-	-	-
Sulphate	27	151	41	36	37.6	35.1	26.4	27.9	34.9	34.3	33.4	24.4	32.5	-	-	-	-
Temperature	-	-	-	-	-	-	-	-						-	-	-	-
TOC	3.6	6.6	4	3	4	4	4	3	5	4	4	3	4	-	-	-	-
TON	5.8	0.51	5.2	1.2	1.1	1.1	3.3	3.3	3.2	3.2	3.1	4.9	4.8	-	-	-	-
Total Phenols by colourimetry	<0.05	<0.05	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.008	0.008	0.046	-
Zinc#	0.18	0.03	0.01	<0.003	<0.003	<0.003	<0.003	<0.003	<3	<3	<3	<3	<3	0.1	0.1	-	-
Faecal Coliforms (cfu/100ml)	>100	18	>100	-	-	-	-	-	**326**	**816**	**980**	**147**	**68**	-	-	-	-
Total Coliforms (cfu/100ml)	>100	>100	>100	-	-	-	-	-	**687**	**1986**	**1413**	**1300**	**687**	-	-	-	-

'-' means no data available
bold - above EQS or water quality guidelines

APPENDIX I: Letter to EPA – 12th February 2016

HYDRO ENVIRONMENTAL SERVICES

22 Lower Main St
Dungarvan
Co.Waterford
Ireland

tel: +353 (0)58 44122
fax: +353 (0)58 44244
email: info@hydroenvironmental.ie
web: www.hydroenvironmental.ie

Date: 18th March, 2016
Our Ref: P1317-0_001

Environmental Licensing Program
Office of Climate, Licensing, Resources & Research,
Environmental Protection Agency Headquarters,
Johnstown Castle Estate,
Co Wexford.

Attn: Inspector Babiarczyk

Dear Ms. Babiarczyk,

Re: Clashford Recovery Facility, Naul, Co. Meath (W0265-01)

Further to your letter of 2nd October 2015 (Re: Notice in Accordance with Article 14(2)(B)(ii) of the Waste Management (Licensing) Regulations) in respect of W0265-01, please find outlined below responses to items relating to the hydrology and hydrogeology of the Clashford Recovery Facility Site in Co. Meath. Other [non water] elements of the Notice are being addressed by JSPE (John Sheils Planning and Environmental Ltd).

For clarity we have included the Article 12 compliance requirement items in numbered italics and provided our responses to each item thereafter. These responses are supported by maps and appendices as referenced.

Item 1

> *'state the source of elevated Ammoniacal Nitrogen, Arsenic, Calcium, Chloride, Chromium, Iron, Lead, Mercury, Phosphorous, Potassium and Sulphate and other contaminants detected in the surface water discharge (emission point SW-2) on 13.01.2009'.*

Item 1 Response

Given the time lapse we cannot state with certainty what the cause of the historic elevated results were, but we can clarify that some results were elevated relative to local background parameter values but were not in exceedance of relevant EQS's. This conclusion was included in the 2009 submission at page 20 of 28, in Appendix I.2.1 (Hydrogeological Risk Assessment – February 2009). This section also suggests that the small increases in background concentrations of Arsenic, Chloride, Chromium, Iron, Lead, Phosphorus, Potassium and Sulphate is most probably due to wheel wash waters that were being discharged at that time, and not as a result of leaching from the fill material.

We have also noted that some additional confusion may have been caused by Appendix C (to Appendix I.2.1 of the Application) that shows the laboratory data results are reported in mg/L and µg/L, but the EQSs shown on the right hand side of the results table is in units of mg/L. While this does not affect the assessment of all results, the metals are reported in units of µg/L and these need to be divided by 1000 to be in units of mg/L (to be comparable to the listed EQS values). As such for Arsenic, Chromium, Iron, and Lead there is no exceedance of the relevant EQS.

In order to clarify these data we have collated and tabulated the original laboratory data, and checked these against the original laboratory result sheet and re-presented these data as a revised Table in Appendix I. This revised table summarises the original laboratory results using standard units (*i.e.* the same as the relevant EQS) and we have also highlighted the elevated results and compared same with appropriate EQS's or Groundwater Assessment Criteria (See Appendix I).

It is important to note that while the discharge water (from 2009) may be elevated for certain parameters there is no indication in the downstream results that these slight elevations in the discharge water were causing a significant alteration of water quality (see increase/decrease magnitude in Table A). In order to demonstrate this we have tabulated certain parameters for upstream and downstream results in Table A. Using the upstream and downstream water quality data from 2009 it is possible, using standard assimilation capacity assessment calculations, to determine the ratio of flow in the receiving water to the discharge flow. The ratio is approximately 6.6 to 1.

Parameter (mg/L)	Upstream	Discharge	Downstream	Increase/Decrease
Ammoniacal Nitrogen	<0.008	0.31	<0.08	None
Chloride	31	64	34	3 mg/L
Conductivity	506	692	529	23 µS/cm
Flouride	<0.1	0.25	<0.1	None
Iron	0.18	0.37	0.23	0.05 mg/L
Phosphorus	0.09	0.27	0.07	-0.02 mg/L
Potassium	2	7	3	1 mg/L
Residue on Evaporation	340	508	318	-22 mg/L
Sodium	14	44	17	3 mg/L
Sulphate	27	151	41	14 mg/L

Table A: Comparison of Upstream and Downstream [of discharge] 2009 surface water data

There are some anomalies [showing a no change or a reduction in downstream concentrations despite slight elevations in the discharge result] such as Flouride, Phosphorus and Residue on Evaporation. Again these cannot be explained but there is no exceedance of any relevant EQS or Groundwater Assessment Criteria (refer to Appendix I) for these anomalous parameters. However these parameters show a reduction in downstream concentration.

Finally, it is the case that one discharge result exceeds an EQS limit, this is Ammoniacal Nitrogen. However downstream results show no increase in receiving water concentration for this parameter, and subsequent sampling in respect of the 2014 EIS (Table 3.4.7 of 2104 EIS, Section 3.4 – Water) show no evidence of contamination.

In summary, we cannot definitively attribute the 2009 slight elevations in certain parameters to any one issue. However, we have reviewed the data and clarified units, and completed an assessment of dilution available in the receiving water [stream] at that time. We can therefore conclude based on the downstream monitoring results that while there were some slight elevations in certain parameters these did not cause any significant impact on water quality in the receiving stream, and therefore could not have caused any significant impact on the downstream waters of the Delvin River.

Item 2

'Provide monitoring results for the surface water discharge conducted within the last three years. Submit also monitoring results for upstream and downstream locations of the discharge and grid reference numbers of the upstream and downstream locations. Also, include grid reference numbers for the location of discharge from the ground drainage to River Delvin.'

Item 2 Response

Surface water monitoring within the last three years was carried out as part of the 2014 EIS. There are no monitoring data for discharge water from the site for the last three year. Also, surface water discharge from the site will only occur in high flow conditions in the tributary stream and Delvin River. Therefore discharges from the site are intermittent.

Surface water quality data for upstream and downstream locations on the tributary to the Delvin River are provided in the 2009 submission and in the 2014 EIS. These data are included as Appendix II.

We would like to take this opportunity to point out there is no specific requirement, unless requested to do so by Meath County Council, to undertake routine monitoring under the existing Waste Permit. The applicant was also not expecting such a significant time lapse between the EIS and the Article 12 notice (or a decision on the application), and therefore was waiting for a decision before any further monitoring was undertaken.

In addition it should be noted that discharge of surface water from the site is intermittent. There is not a continuous discharge. Having inspected the site and viewed the settlement ponds it is clear that discharge overflow from the settlement ponds only occurs in very wet weather, and as such only occurs when stream and downstream river flows are highest.

Grid locations for upstream and downstream monitoring locations and also for groundwater drain discharge locations are presented in **Table B** below. **Figure A** shows the locations of surface water monitoring SW-1, SW-2, SW-3, SW-4 (2014 only) and SW-5 (2014 only). **Figure B** shows the locations of the discharge location (DL-1), and the groundwater drain discharge locations to the Delvin River (GD-1, GD2, and GD-3).

ID	Easting	Northing	Location
SW-1	313,170	261,158	Upstream (Delvin River)
SW-2	313,291	261,184	Downstream of Kilsaran Batching Plant (Delvin River)
SW-3	314,000	261,917	Downstream of Site (Delvin River)
SW-4	313,399	261,785	Upstream of discharge point (Northern tributary)
SW-5	313,456	261,816	Downstream of Discharge point (Northern Tributary)
DL-1	313,333	261,758	Surface water discharge location to tributary to the Delvin River
GD-1	313,586	261,410	Groundwater drain 1
GD-2	313,672	261,490	Groundwater drain 2
GD-3	313742	261541	Groundwater drain 3
GD-4	313741	261582	Groundwater drain 4 (not a direct discharge to the river, this drain discharges onto the ground in a low area close to the river)

Table A: Surface Water Monitoring Locations

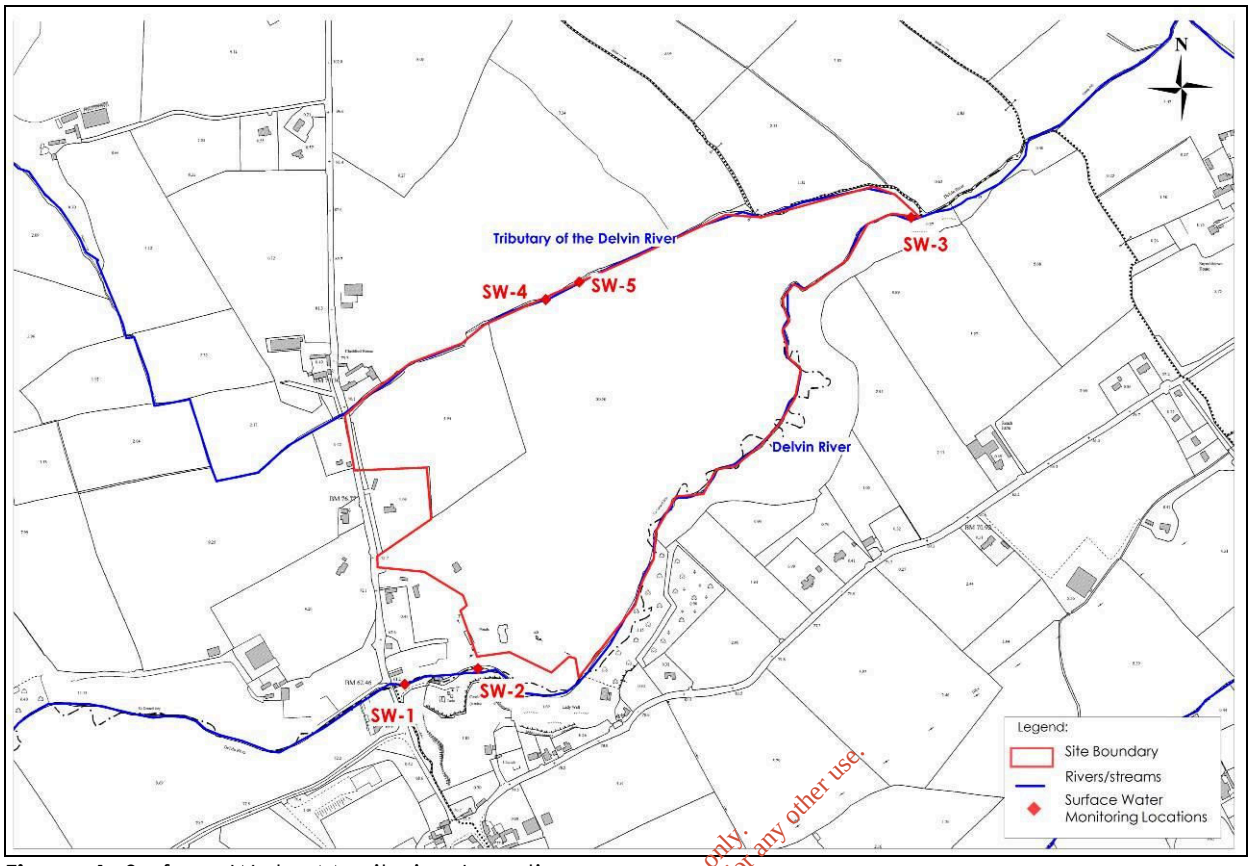


Figure A: Surface Water Monitoring Locations

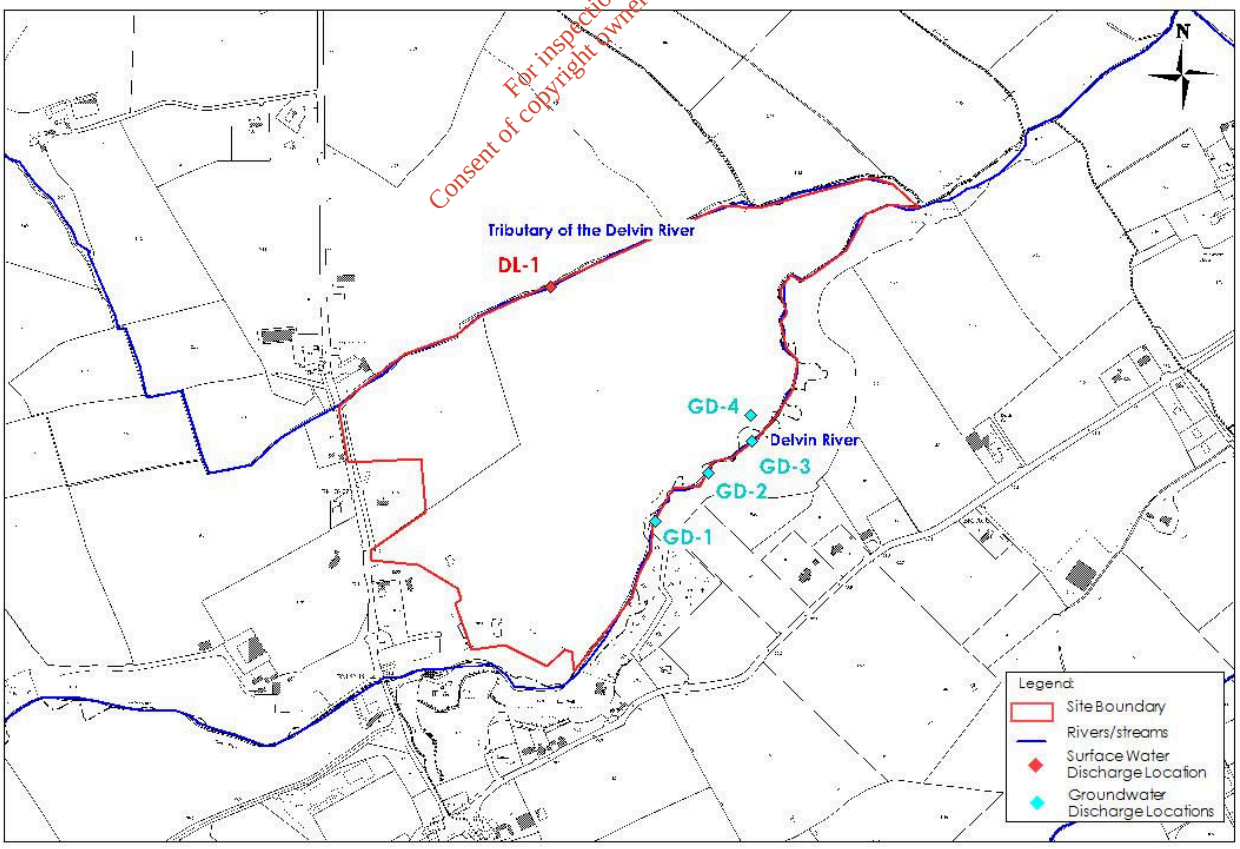


Figure B: Surface water and groundwater discharge locations

Item 3

'Provide results for groundwater, dust and noise monitoring conducted within the last three years. In addition confirm whether GW-2 is currently the only active down-gradient monitoring location for the site. Include a drawing showing all monitoring locations.'

Item 3 Response

Dust and noise monitoring results do not form part of this submission and is being addressed within a separate part of the submission by JSPE.

Groundwater results for 2009 and 2014 have been tabulated and are included as Appendix III (Table 1 and Table 2). There are no other data available for these locations. Grid references for groundwater monitoring well locations are presented in **Table C** below, and shown on **Figure C**.

GW-2, GW-3 and GW-4 are all location down-gradient of the site, between the fill area and the Delvin River. The direction of groundwater flow at the site is from the northwest towards the southeast in the direction of the Delvin River. The exceedances of IGV values noted (in Appendix III_Table 2)for Ammoniacal N, chloride and microbial pathogens are most likely related to land spreading of organic fertilizer at the land to encourage grass growth following restoration. This issue is discussed in d detail in the 2014 EIS.

ID	Easting	Northing	Location
GW-1	313,153	261,367	Up-gradient
GW-2	313,387	261,240	Down-gradient
GW-3	313,508	261,437	Down-gradient
GW-4	313,747	261,559	Down-gradient

Table C: Groundwater Monitoring Locations

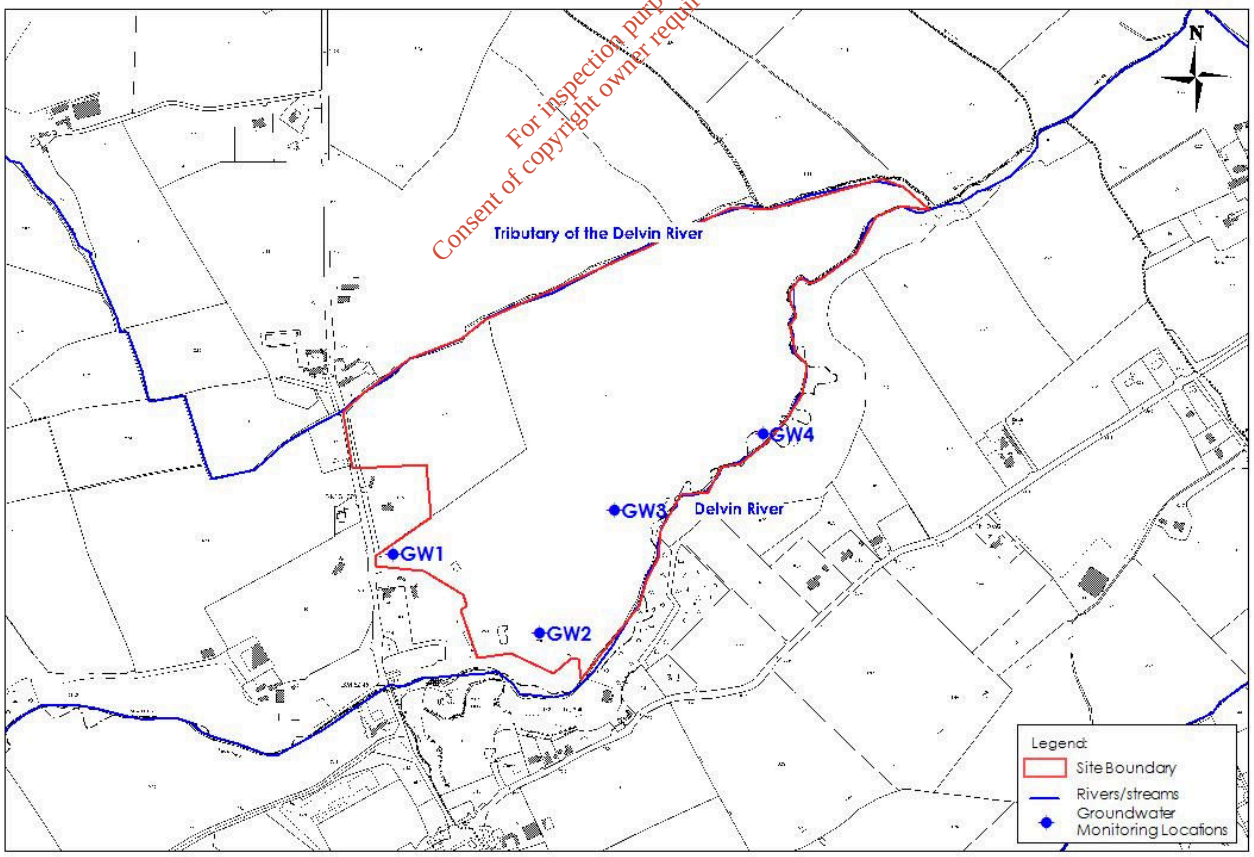


Figure C: Groundwater Monitoring Locations

Item 4

'State whether the proposed reed bed polishing filter is still planned for the site. If yes, provide information on its location, design and operation, including the commencement date for its operation.'

Item 4 Response

The reed bed polishing filter has not been constructed at the site, and there are no plans to construct same in the future.

Alternatively, a large settlement lagoon was constructed and was in place before 2009, and this were designed to provide sufficient settlement of fines prior to discharge. **Figure D** shows the location of this lagoon. It is important to note, that the overflow discharge from this lagoon outfalls to the stream (Tributary 1) on the northern boundary of the site, which is a tributary of the River Delvin, and such overflow discharge only occurs in periods of high precipitation, when the stream is in a fast flowing state.

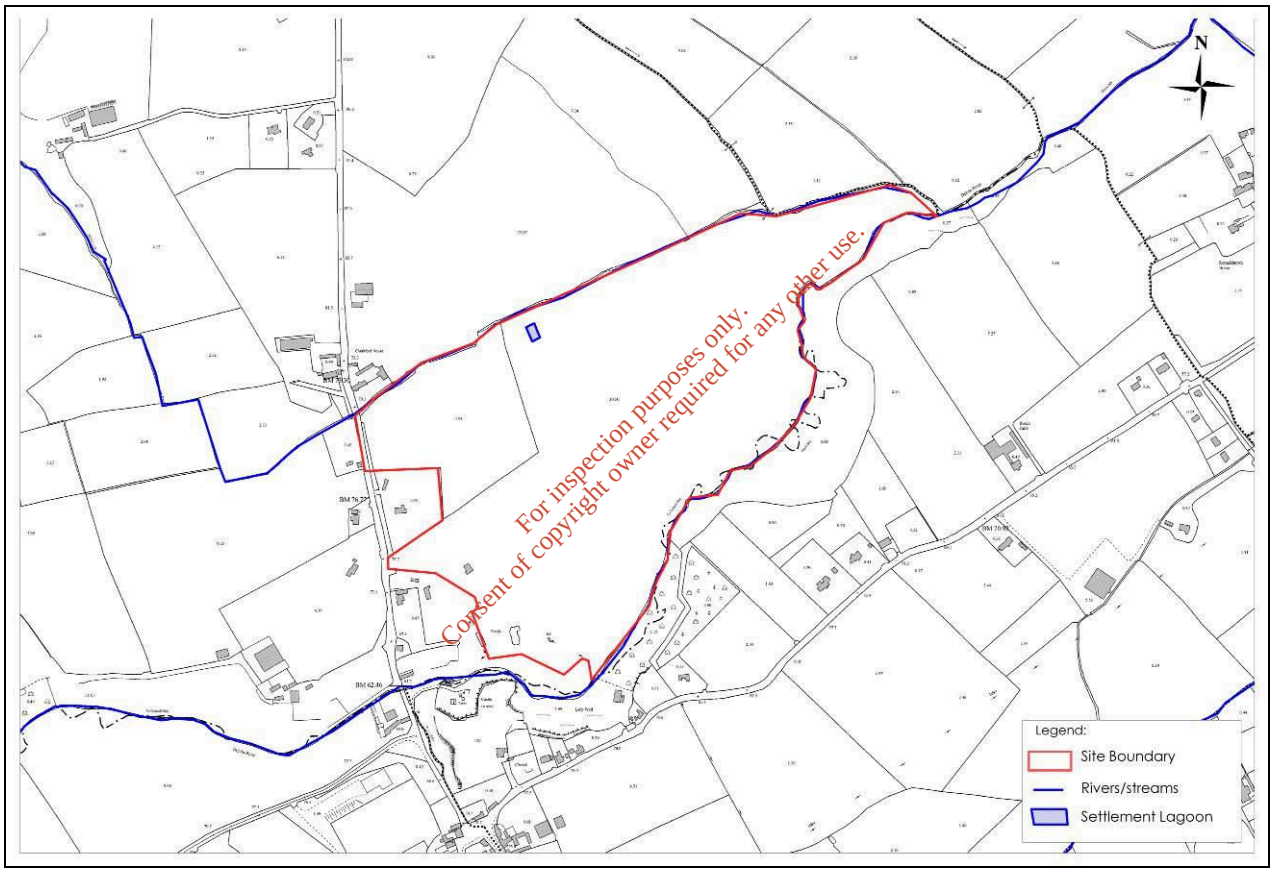


Figure D: Settlement Lagoon Location

Item 5

'Provide copies of the Annual Environmental Reports submitted to date to Meath County Council as required under the Waste Permit Reg. No. 2005/25.'

Item 5 Response

As stated, there are no water quality results in any AERs, as there is no requirement to complete same under WMP2005/25. Copies of available monitoring data are provided in Appendix I, II, and III. AERs will be submitted by JSPE.

Item 7

'A screening for Appropriate Assessment was undertaken on 29 September 2015 and the agency determined that an Appropriate Assessment of the activity is required. You are thereby required to submit a Natura Impact Statement as defined in Regulation 2 (1) of the European Communities (Birds and Natural Habitats) Regulations (S.I. No. 477 of 2011).

You are furthermore advised to refer to the document 'Appropriate Assessment of Plans and Projects in Ireland –Guidance for Planning Authorities', issued in 2009 by the Department of the Environment, Heritage and Local Government, and revised in 2010.'

Item 7 Response

We note the above request.

However, we wish to point out that the site is located adjacent to the Delvin River at Clashford. The Delvin River flows in a northeasterly direction and enters the Irish Sea at some 8.9kms from the site. We have also consulted with the ecologist that prepared the AA Screening report and his additional comments are outlined below.

> "*The recent monitoring of the Delvin River has shown that outflows from the site have not altered the condition of the river to any significant extent. In addition EPA Q- values show that on all sampling occasions the river below the development site is in better condition than that above it. Invertebrates (what Q-values are based on) are more sensitive to substances in the water than birds, so if they are not affected then neither will the visiting birdlife which is the basis of the SPA designation*". (Dr. *Roger Goodwillie, Consulting Ecologist 2016, pers. comm., 22nd January 2016).*

With regards to Appropriate Assessment there are a number of Natura 2000 sites within 15km of the Clashford Facility, namely:

- River Nanny Estuary and Shore SPA (Site Code: 004158)
- Boyne Coast Estuary SAC (Site Code: 001957)
- Boyne Estuary SPA (Site Code: 004080)
- Rockabill to Dalkey Island (Site Code: 003000)
- Rockabill SPA (Site Code: 004014)
- Skerries Islands SPA (Site Code: 004122)
- Rogerstown Estuary SAC (Site Code: 000208)
- Rogerstown Estuary SPA (Site Code: 004015)
- Lambay Island SAC (Site Code: 000204)
- Lambay Island SPA (Site Code: 004069)

In order for potential to exist for any of these sites to be impacted by the proposed development at Clashford there firstly has to be a hydrological connection between the Clasford Site and any of the local Natura 2000 sites.

The only pathways for hydrological connection area via surface water or groundwater flows.

Groundwater at the Clashford site discharges to the Delvin River, therefore any wider discharge of groundwater is not considered further, as groundwater pathways to the Nanny River, the Boyne or south to the Rogerstown Estuary cannot physically exist.

Therefore the only conceivable pathway for contact/potential impact with any of the Natura 2000 sites listed above is via the water flow provided within the Delvin River, *i.e.* sediment or contaminated surface water is transmitted by the Delvin River to any of the Natura 2000 sites listed above.

The determination requiring a Stage II Appropriate Assessment/NIS for the development at Clashford is based on two reasons, namely:

- Monitoring results submitted by the Applicant for surface water run-off discharge from the site show that this discharge is contaminated with parameters such as ammoniacal nitrogen, arsenic, calcium, chloride, chromium, lead, and others.
- There is uncertainty about whether the contaminated run-off has potential to reach and impact the European Sites.

The 2009 surface water discharge data is discussed above, and we conclude that the only parameter to exceed an EQS was ammonical nitrogen, but downstream monitoring indicates this did not cause any impact on water quality. The remainder of the parameters, while locally elevated did not exceed any EQS, and also did not result in any significant alteration of water quality in the Delvin River. Surface water discharge from the site will only occur in high flow conditions in the stream and Delvin River.

Further surface water monitoring provided in the 2014 EIS indicates that agricultural runoff may be affecting water quality in the tributary to the Delvin River, but there is no suggestion that the activity at the site is causing contamination of surface water downstream of the site.

There is a considerable distance between the Clashford site and any of the Natura 2000 sites. For all Natura 2000 sites sediment or surface water has to travel in the river and then the sea to get to any of the Natura 2000 sites. The shortest flowpath is to the River Nanny Estuary and Shore SPA (Site Code: 004158), and this is some 10.5kms (including 1.5kms of open sea water). Assuming an average near shore sea depth of 5m, and using the near shore 500m width (as a likely flow path from the Delvin estuary towards the SPA), the volume of this near shore body of water is some 3,750,000m^3 of sea water. The dilution available in the sea for any minor water quality issue in the Delvin River is significant and will buffer the SPA from any significant potential impact.

Furthermore, the proposed facility is for soil and stone, and no contaminated material has or will be deposited at the site. As such the risk to surface water and to groundwater from the site is not significant. Given the separation distances, and the very unlikely scenario of significant pollution emerging or being discharged from the site, the risk to downstream Natura 2000 sites is not significant.

Appropriate best practice drainage mitigation as outlined in the EIS and the application will be implemented on site to ensure surface water quality downstream of the site is protected, and therefore ensures there will be no significant impact on the downstream Natura 200 sites. This approach is in line with the 2014 judgement of Mr. Justice Hedigan in Rossmore and Killross v An Bord Pleanála, the State and Eirgrid[1].

On the basis of the above, the requirement to complete a Stage II Appropriate Assessment/NIS appears to be an extreme interpretation of the Habitats Directive requirements. We therefore request that you re consider this determination.

Closure
I trust the above meets your requirements and we look forward to a favourable response on this matter.

Yours sincerely,

Michael Gill P. Geo
BA, BAI, MSc, Dip. Geol, MIEI, MCIWEM

[1] Hedigan (2014) Mr. Justice Hedigan in Rossmore and Killross v An Bord Pleanála, the State and Eirgrid

APPENDIX I

Appendix 1
Clashford Recovery Facility, Naul, Co. Meath
Summary of 2009 Surface Water Chemistry Data

Sample Date	LAB ID	Upstream	Discharge	Downstream	EQS - Surface Water mg/l	Water Guidelines		
						2009 SW Regs AA (mg/l)	2009 SW Regs MAC (mg/l)	Salmonid water regulations SI 293/1988
Parameters								
Alkalinity (mg/l)	n/a	220	165	220	-			
Ammoniacal Nitrogen (mg/l)	n/a	<0.08	**0.31**	<0.08	0.02 NH_3			<0.02
Arsenic (mg/l)	++	*0.001*	*0.0051*	*0.0015*	0.025	0.025		
Barium (mg/l)	++	*0.034*	*0.037*	*0.034*	0.1			
Boron	++	0.05	0.06	0.05	2			
Cadmium(mg/l)	**	*0.00027*	*0.00028*	*<0.0001*	0.005			
Calcium	**	94	109	96		0.0047/0.0034	32/-	
Chloride	**	31	64	34	250			
Chromium(mg/l)	**	*<0.001*	*0.019*	*<0.001*	0.03			
Conductivity (µS/cm @ 20'C)	**	506	692	529	1000		-	
Copper	**	<0.05	<0.05	<0.05	0.03	0.005/0.03	-	
Cyanide	n/a	<0.01	<0.01	<0.01	0.01	0.01		
Dissolved Oxygen	n/a	11.5	11.3	11.7				50% or ≥9(mg/L)
Fluoride	**	<0.1	0.25	<0.1	5	5	-	
Iron#	**	0.18	0.37	0.23	1			
Lead(mg/l)	**	*<0.002*	*0.004*	*<0.002*	0.01	0.0072	n/a	
Magnesium	**	8	10	8				
Manganese#	**	0.06	0.08	0.06	0.3			
Mercury (mg/l)	++	*<0.00005*	*<0.00005*	*<0.00005*	0.001	0.00005	0.00007	
Nickel#	**	<0.10	<0.10	<0.10	0.05	0.02	n/a	
Nitrate	**	25	2	23	50			
Nitrite	**	<0.2	<0.2	<0.2	0.2			≤0.05
pH	**	7.9	7.8	7.9				>6 and <9
Phosphate (low Level)	n/a	0.08	0.11	0.1				
Phosphorus	n/a	0.09	0.27	0.07				
Potassium	**	2	7	3				
Residue on Evaporation @ 180'C	n/a	340	508	318				
Selenium(mg/l)	++	*0.0015*	*0.002*	*0.0016*				
Silver	++	<0.01	0.02	0.01				
Sodium	**	14	44	17				
Sulphate	**	27	151	41	200			
Temperature	n/a	-	-	-				
TOC	n/a	3.6	6.6	4				
TON	**	5.8	0.51	5.2				
Total Phenols by colourimetry	n/a	<0.05	<0.05	<0.05		0.008	0.046	
Zinc#	**	0.18	0.03	0.01	0.1	0.008/0.05/0.1	-	
Faecal Coliforms (cfu/100ml)	n/a	>100	18	>100				
Total Coliforms (ctu/100ml)	n/a	>100	>100	>100				

-' means no data available
** = INAB Accredited Tests
++ = Subcontracted Tests
n/a = Non-INAB Accredited Tests
Analysis of metals are performed on the filtered sample
slightly elevated relative to upstream and downstream, but not above EQS
bold - above EQS
0.001 - Original lab results were in µg/L, and results shown are converted to mg/L

APPENDIX II

T.E. LABORATORIES LIMITED
Trading as
TelLab

Tullow Industrial Estate, Tullow, Co. Carlow
Phone: 059-9152881 Fax: 059-9152886

CERTIFICATE OF ANALYSIS

Page 1 of 2

Project Description:	Analysis of Aqueous Sample		
Attention:	Mr.Shane Ryan	**Lab ID:**	77766
Address:	I.E. Consulting Innovation Centre RTC Campus Carlow	**Date Sampled:**	08.01.2009
Certificate No:	L/09/0205	**Date Rec'd:**	08.01.2009
Issue Date:	30.01.2009	**Our Ref:**	WS-23403

Project Summary: One sample was analysed for a range of determinands. Please see page 2 for results. Terms & Conditions and methods used are outlined in the attached appendix.

No. of Pages: Results page 2

Mr. Mark Bowkett
Chief Executive

Ms Breda Moore
Technical Manager

TelLab

ANALYSIS OF AQUEOUS SAMPLE.

Date Sampled:08.01.2009
Date Received: 08.01.2009
Date Analysis Commenced: 08.01.2009
Our Ref:WS-23403
Certificate No: L/09/0205

	Sample ID	GW1	GW Interim Guideline Value
Determinand	**Lab ID**	**77766**	**mg/l**
Alkalinity	n/a	230	**no abnormal change**
Ammoniacal Nitrogen	n/a	<0.08	**0.15**
Arsenic(ug/l)	++	0.6	**0.01**
Barium(ug/l)	++	29	**0.1**
Boron	++	0.03	**1.0**
Cadmium(ug/l)#	**	<0.10	**0.005**
Calcium	**	67	**200**
Chloride	**	19	**30**
Chromium (ug/l)#	**	<1	**0.03**
Conductivity(uS/cm @ 20'C)	**	417	**1000**
Copper	**	<0.05	**0.03**
Cyanide	n/a	<0.01	**0.01**
Dissolved Oxygen	n/a	5.8	**no abnormal change**
Fluoride	**	0.11	**1**
Iron#	**	0.13	**0.2**
Lead(ug/l)	**	<2	**0.01**
Magnesium	**	13	**50**
Manganese#	**	0.03	**0.05**
Mercury(ug/l)	++	<0.05	**0.001**
Nickel(ug/l)	++	5	**0.02**
Nitrate	**	0.8	**25**
Nitrite	**	<0.2	**0.1**
pH	**	7.5	**>=6.5 and <=9.5**
Phosphate	**	<1	**0.03**
Phosphorus	n/a	<0.05	
Potassium	**	2	**5**
Residue on Evaporation @ 180'C	n/a	235	
Selenium(ug/l)	++	1.2	
Silver	++	<0.01	
Sodium	**	20	**150**
Sulphate	**	16	**200**
Temperature	n/a	not recorded	**25**
TOC	n/a	1.2	**no abnormal change**
TON	n/a	<0.24	**no abnormal change**
Total phenols	n/a	<0.05	
Zinc#	**	0.02	**0.1**
Total Coliforms(cfu/100ml)	n/a	**>100**	**0 counts per 100ml**
Faecal Coliforms(cfu/100ml)	n/a	0	**0 counts per 100ml**

Results expressed as mg/l (ppm)
unless stated otherwise

** = INAB Accredited Tests ++ = Subcontracted Tests n/a = Non-INAB Accredited Tests

The above results relate only to the sample tested
This report should not be regenerated except in full and with the consent of T.E. Laboratories Ltd.

Analysis of metals are performed on the filtered sample

T.E. LABORATORIES LIMITED
Trading as
TelLab

Tullow Industrial Estate, Tullow, Co. Carlow
Phone: 059-9152881 Fax: 059-9152886

CERTIFICATE OF ANALYSIS

Project Description:	Analysis of Aqueous Sample		
Attention:	Mr. Shane Ryan	**Lab ID:**	77881-77883
Company:	Geotechnical & Environmental Services Ltd.	**Date Sampled:**	13.01.2009
Address:	Innovation Centre, RTC Campus, Carlow		
Certificate No:	L/09/0256	**Date Rec'd:**	13.01.2009
Issue Date:	04.02.2009	**Our Ref:**	WS-23444, 153842

Project Summary: Three samples were analysed for a range of determinands. Please see page 2 for results. Terms & Conditions and methods used are outlined in the attached appendix.

No. of Pages: Results page 2

Mr Mark Bowkett
Chief Executive

Ms Breda Moore
Technical Manager

TelLab

ANALYSIS OF AQUEOUS SAMPLE.

Date Sampled :13.01.2009
Date Received: 13.01.2009
Date Analysis Commenced: 13.01.2009
Our Ref.: WS-23444, 153842
Certificate No: L/09/0256
Your Ref.: Clashford

DETERMINAND	Sample ID / Lab ID	Clashford Upstream 77883	Clashford Discharge 77881	Clashford Downstream 77882	EQSs Surface Water mg/l
Alkalinity	n/a	220	165	220	/
Ammoniacal Nitrogen	n/a	<0.08	0.31	<0.08	**0.02 NH3**
Arsenic(ug/l)	++	1.0	5.1	1.5	**0.025**
Barium(ug/l)	++	34	37	34	**0.1**
Boron	++	0.05	0.06	0.05	**2.0**
Cadmium(ug/l)	**	0.27	0.28	<0.1	**0.005**
Calcium	**	94	109	96	
Chloride	**	31	64	34	**250**
Chromium(ug/l)	**	<1	1.9	<1	**0.03**
Conductivity (uS/cm @ 20'C)	**	506	692	529	**1000**
Copper	**	<0.05	<0.05	<0.05	**0.03**
Cyanide	n/a	<0.01	<0.01	<0.01	**0.01**
Dissolved Oxygen	n/a	11.5	11.3	11.7	
Fluoride	**	<0.1	0.25	<0.1	**5**
Iron#	**	0.18	0.37	0.23	**1.0**
Lead(ug/l)	**	<2	4.0	<2	**0.01**
Magnesium	**	8	10	8	
Manganese#	**	0.06	0.08	0.06	**0.3**
Mercury (ug/l)	**	<0.05	<0.05	<0.05	**0.001**
Nickel#	**	<0.10	<0.10	<0.10	**0.05**
Nitrate	**	25	2	23	**50**
Nitrite	**	<0.2	<0.2	<0.2	**0.2**
pH	**	7.9	7.8	7.9	
Phosphate (low Level)	n/a	0.08	0.11	0.10	
Phosphorus	n/a	0.09	0.27	0.07	
Potassium	**	2	7	3	
Residue on Evaporation @ 180'C	n/a	340	508	318	
Selenium(ug/l)	++	1.5	2.0	1.6	
Silver	++	<0.01	0.02	0.01	
Sodium	**	14	44	17	
Sulphate	**	27	151	41	**200**
Temperature	n/a	not recorded	not recorded	not recorded	
TOC	n/a	3.6	6.6	4.0	
TON	**	5.8	0.51	5.2	
Total Phenols by colourimetry	n/a	<0.05	<0.05	<0.05	
Zinc#	**	0.18	0.03	0.01	**0.1**
Faecal Coliforms (cfu/100ml)	n/a	>100	18	>100	
Total Coliforms (cfu/100ml)	n/a	>100	>100	>100	

Concentrations are expressed as mg/l (ppm)
unless otherwise specified.

** = INAB Accredited Tests ++ = Subcontracted Tests n/a = Non-INAB Accredited Tests
# Analysis of metals are performed on the filtered sample

The above results relate only to the sample tested
This report should not be regenerated except in full and with the consent of T.E. Laboratories Ltd.

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

IE Consulting
Innovation Centre
Green Road
Carlow
Co. Carlow

4225

Attention :	Aine McElhinney
Date :	13th August, 2014
Your reference :	IE912
Our reference :	Test Report 14/8935 Batch 1
Location :	
Date samples received :	7th August, 2014
Status :	Final report
Issue :	1

Eight samples were received for analysis on 7th August, 2014. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Bruce Leslie
Project Co-ordinator

Bob Millward BSc FRSC
Principal Chemist

Client Name: IE Consulting
Reference: IE912
Location:
Contact: Aine McElhinney
JE Job No.: 14/8935

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

J E Sample No.	1-5	6-10	11-15	16-20	21-25	26-30	31-35	36-40			LOD/LOR	Units	Method No.
Sample ID	LARRY KIERNAN IE912 GW1	LARRY KIERNAN IE912 GW2	LARRY KIERNAN IE912 GW4	LARRY KIERNAN IE912 SW1	LARRY KIERNAN IE912 SW2	LARRY KIERNAN IE912 SW3	LARRY KIERNAN IE912 SW4	LARRY KIERNAN IE912 SW5					
Depth													
COC No / misc													
Containers	H HN P G	H HN P G	H HN P G	H HN P BOD G	H HN P BOD G	H HN P BOD G	H HN P BOD G	H HN P BOD G					
Sample Date	05/08/2014	05/08/2014	05/08/2014	05/08/2014	05/08/2014	05/08/2014	05/08/2014	05/08/2014					
Sample Type	Ground Water	Ground Water	Ground Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water					
Batch Number	1	1	1	1	1	1	1	1					
Date of Receipt	07/08/2014	07/08/2014	07/08/2014	07/08/2014	07/08/2014	07/08/2014	07/08/2014	07/08/2014					
Dissolved Calcium #	65.6	90.7	109.3	95.9	94.0	93.1	81.3	94.3			<0.2	mg/l	TM30/PM14
Total Dissolved Iron #	116	28	154	77	81	72	39	21			<20	ug/l	TM30/PM14
Dissolved Magnesium #	13.1	22.9	19.5	6.7	6.6	6.5	7.7	8.6			<0.1	mg/l	TM30/PM14
Dissolved Manganese #	24	455	937	-	-	-	-	-			<2	ug/l	TM30/PM14
Dissolved Potassium #	2.1	1.9	75.2	6.2	6.5	6.2	3.6	4.6			<0.1	mg/l	TM30/PM14
Dissolved Sodium #	20.4	20.2	94.8	11.2	11.5	11.9	14.5	50.2			<0.1	mg/l	TM30/PM14
Total Phosphorus	22	34	54	222	178	165	93	67			<5	ug/l	TM30/PM14
EPH (C8-C40) #	<10	<10	<10	<10	<10	<10	<10	<10			<10	ug/l	TM5/PM30
C8-C40 Mineral Oil (Calculation)	<10	<10	<10	<10	<10	<10	<10	<10			<10	ug/l	TM5/PM30
Sulphate #	22.75	73.97	138.27	42.44	41.99	66.63	64.03	66.53			<0.05	mg/l	TM38/PM0
Chloride #	18.9	25.0	120.4	23.7	23.6	28.2	28.9	79.3			<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	0.6	0.7	0.4	9.3	19.5	9.9	18.9	18.4			<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02	<0.02	0.04	0.03	0.04	<0.02	<0.02			<0.02	mg/l	TM38/PM0
Ortho Phosphate as PO4 #	<0.06	<0.06	<0.06	0.35	0.32	0.42	<0.06	<0.06			<0.06	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH4 #	<0.03	0.08	1.40	0.13	0.24	0.12	0.08	0.07			<0.03	mg/l	TM38/PM0
Total Ammonia as N #	<0.03	0.06	1.09	0.10	0.19	0.09	0.06	0.05			<0.03	mg/l	TM38/PM0
Total Alkalinity as CaCO3 #	226	278	230	230	220	220	190	204			<1	mg/l	TM75/PM0
BOD (Settled) #	-	-	-	11	13	9	8	6			<1	mg/l	TM58/PM0
Electrical Conductivity @25C #	458	629	1140	532	523	562	514	714			<2	uS/cm	TM76/PM0
Faecal Coliforms*	0	0	20	-	-	-	-	-				CFU/100ml	Subcontracted
Free Ammonia as NH3	<0.07	<0.07	0.77	0.12	0.18	0.11	<0.07	<0.07			<0.07	mg/l	TM53/PM0
pH #	7.82	7.72	10.64	7.98	8.06	8.12	8.02	7.93			<0.01	pH units	TM73/PM0
Total Coliforms*	0	3	600	-	-	-	-	-				CFU/100ml	Subcontracted
Total Suspended Solids #	-	-	-	<10	12	13	11	11			<10	mg/l	TM37/PM0
Turbidity	0.3	0.3	0.5	-	-	-	-	-			<0.1	NTU	TM34/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: IE Consulting

Reference: IE912

Location:

Contact: Aine McElhinney

Matrix : Liquid

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
14/8935	1					Samples were received at a temperature above 9°C.

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 14/8935

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
OC	Outside Calibration Range

JE Job No: 14/8935

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Air Dried (AD)	Reported on dry weight basis
TM5	In-House method based on USEPA 8015B. Determination of Extractable Petroleum Hydrocarbons (EPH) in the carbon chain length range of C8-40 by GC-FID. Accredited to ISO 17025 on soil and water samples and MCERTS (carbon banding only) on soils. All accreditation is matrix specific.	PM30	In-house method based on USEPA 3510. Liquid samples are mixed with solvent and agitated with an automatic magnetic stirrer with a stir bar for 15 minutes to extract organic molecules. ISO 17025 accredited extraction method. All accreditation is matrix specific				
TM5	In-House method based on USEPA 8015B. Determination of Extractable Petroleum Hydrocarbons (EPH) in the carbon chain length range of C8-40 by GC-FID. Accredited to ISO 17025 on soil and water samples and MCERTS (carbon banding only) on soils. All accreditation is matrix specific.	PM30	In-house method based on USEPA 3510. Liquid samples are mixed with solvent and agitated with an automatic magnetic stirrer with a stir bar for 15 minutes to extract organic molecules. ISO 17025 accredited extraction method. All accreditation is matrix specific	Yes			
TM30	Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry) using Thermo iCAP 6000 series instrument. Accredited to ISO 17025 for soils and waters and MCERTS accredited for Soils. All accreditation is matrix specific.	PM14	In-house method based on USEPA 3005A. Acid digestion of water samples and analsyis by ICP-OES as per method TM030W.ISO 17025 accredited extraction method. All accreditation is matrix specific				
TM30	Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry) using Thermo iCAP 6000 series instrument. Accredited to ISO 17025 for soils and waters and MCERTS accredited for Soils. All accreditation is matrix specific.	PM14	In-house method based on USEPA 3005A. Acid digestion of water samples and analsyis by ICP-OES as per method TM030W.ISO 17025 accredited extraction method. All accreditation is matrix specific	Yes			
TM34	Turbidity by Turbidimeter	PM0	No preparation is required.				
TM37	Total Suspended Solids- gravimetric	PM0	No preparation is required.	Yes			
TM38	Ionic analysis using the Thermo Aquakem Photometric Automatic Analyser. Accredited to ISO17025 and MCERTS for most analytes. All accreditation is matrix specific.	PM0	No preparation is required.	Yes			
TM53	Ammonia by Colourimetric measurement	PM0	No preparation is required.				
TM58	In-house method based on USEPA 405.1 and BS 5667-3. Meausremnet of Biochemical Oxygen Demand by oxygen probe. ISO 17025 accredited. Accreditation is matrix specific.	PM0	No preparation is required.	Yes			
TM73	pH in by Metrohm	PM0	No preparation is required.	Yes			

JE Job No: 14/8935

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Air Dried (AD)	Reported on dry weight basis
TM75	Alkalinity by Metrohm	PM0	No preparation is required.	Yes			
TM76	Electrical Conductivity by Metrohm	PM0	No preparation is required.	Yes			
Subcontracted	Subcontracted analysis, sent to an ISO 17025 accredited laboratory where possible.						

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

IE Consulting
Innovation Centre
Green Road
Carlow
Co. Carlow

4225

Attention :	Aine McElhinney
Date :	22nd August, 2014
Your reference :	IE912
Our reference :	Test Report 14/9172 Batch 1
Location :	Naul
Date samples received :	14th August, 2014
Status :	Final report
Issue :	1

One sample was received for analysis on 14th August, 2014. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Phil Sommerton BSc
Project Manager

Bob Millward BSc FRSC
Principal Chemist

Client Name: IE Consulting
Reference: IE912
Location: Naul
Contact: Aine McElhinney
JE Job No.: 14/9172

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-5												
Sample ID	GW3												
Depth													
COC No / misc													
Containers	H HN P G												
Sample Date	11/08/2014												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	14/08/2014												

Please see attached notes for all abbreviations and acronyms

		LOD/LOR	Units	Method No.
Dissolved Calcium #	119.1	<0.2	mg/l	TM30/PM14
Total Dissolved Iron #	<20	<20	ug/l	TM30/PM14
Dissolved Magnesium #	30.7	<0.1	mg/l	TM30/PM14
Dissolved Manganese #	104	<2	ug/l	TM30/PM14
Dissolved Potassium #	9.9	<0.1	mg/l	TM30/PM14
Dissolved Sodium #	26.6	<0.1	mg/l	TM30/PM14
Total Phosphorus	460	<5	ug/l	TM30/PM14
EPH (C8-C40) #	<10	<10	ug/l	TM5/PM30
C8-C40 Mineral Oil (Calculation)	<10	<10	ug/l	TM5/PM30
Sulphate #	90.82	<0.05	mg/l	TM38/PM0
Chloride #	110.1	<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	0.2	<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02	mg/l	TM38/PM0
Ortho Phosphate as PO4 #	<0.06	<0.06	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH4 #	<0.03	<0.03	mg/l	TM38/PM0
Total Ammonia as N #	<0.03	<0.03	mg/l	TM38/PM0
Total Alkalinity as CaCO3 #	270	<1	mg/l	TM75/PM0
Electrical Conductivity @25C #	938	<2	uS/cm	TM76/PM0
Faecal Coliforms*	>100		CFU/100ml	Subcontracted
Free Ammonia as NH3	<0.07	<0.07	mg/l	TM53/PM0
pH #	7.62	<0.01	pH units	TM73/PM0
Total Coliforms*	>100		CFU/100ml	Subcontracted
Turbidity	0.5	<0.1	NTU	TM34/PM0

Client Name: IE Consulting

Reference: IE912

Location: Naul

Contact: Aine McElhinney

Matrix : Liquid

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
14/9172						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 14/9172

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on our deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
OC	Outside Calibration Range

JE Job No: 14/9172

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	In-House method based on USEPA 8015B. Determination of Extractable Petroleum Hydrocarbons (EPH) in the carbon chain length range of C8-40 by GC-FID. Accredited to ISO 17025 on soil and water samples and MCERTS (carbon banding only) on soils. All accreditation is matrix specific.	PM30	In-house method based on USEPA 3510. Liquid samples are mixed with solvent and agitated with an automatic magnetic stirrer with a stir bar for 15 minutes to extract organic molecules. ISO 17025 accredited extraction method. All accreditation is matrix specific				
TM5	In-House method based on USEPA 8015B. Determination of Extractable Petroleum Hydrocarbons (EPH) in the carbon chain length range of C8-40 by GC-FID. Accredited to ISO 17025 on soil and water samples and MCERTS (carbon banding only) on soils. All accreditation is matrix specific.	PM30	In-house method based on USEPA 3510. Liquid samples are mixed with solvent and agitated with an automatic magnetic stirrer with a stir bar for 15 minutes to extract organic molecules. ISO 17025 accredited extraction method. All accreditation is matrix specific	Yes			
TM30	Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry) using Thermo iCAP 6000 series instrument. Accredited to ISO 17025 for soils and waters and MCERTS accredited for Soils. All accreditation is matrix specific.	PM14	In-house method based on USEPA 3005A. Acid digestion of water samples and analsyis by ICP-OES as per method TM030W.ISO 17025 accredited extraction method. All accreditation is matrix specific				
TM30	Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry) using Thermo iCAP 6000 series instrument. Accredited to ISO 17025 for soils and waters and MCERTS accredited for Soils. All accreditation is matrix specific.	PM14	In-house method based on USEPA 3005A. Acid digestion of water samples and analsyis by ICP-OES as per method TM030W.ISO 17025 accredited extraction method. All accreditation is matrix specific	Yes			
TM34	Turbidity by Turbidimeter	PM0	No preparation is required.				
TM38	Ionic analysis using the Thermo Aquakem Photometric Automatic Analyser. Accredited to ISO17025 and MCERTS for most analytes. All accreditation is matrix specific.	PM0	No preparation is required.	Yes			
TM53	Ammonia by Colourimetric measurement	PM0	No preparation is required.				
TM73	pH in by Metrohm	PM0	No preparation is required.	Yes			
TM75	Alkalinity by Metrohm	PM0	No preparation is required.	Yes			
TM76	Electrical Conductivity by Metrohm	PM0	No preparation is required.	Yes			

JE Job No: 14/9172

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
Subcontracted	Subcontracted analysis, sent to an ISO 17025 accredited laboratory where possible.						

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

IE Consulting
Innovation Centre
Green Road
Carlow
Co. Carlow

Attention :	Aine McElhinney
Date :	24th September, 2014
Your reference :	IE912
Our reference :	Test Report 14/10407 Batch 1
Location :	Naul
Date samples received :	12th September, 2014
Status :	Final report
Issue :	1

Two samples were received for analysis on 12th September, 2014. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Bruce Leslie
Project Co-ordinator

Bob Millward BSc FRSC
Principal Chemist

Client Name: IE Consulting
Reference: IE912
Location: Naul
Contact: Aine McElhinney
JE Job No.: 14/10407

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-5	6-10									LOD/LOR	Units	Method No.
Sample ID	GW3	GW4											
Depth													
COC No / misc													
Containers	H HN P G	H HN P G											
Sample Date	10/09/2014	10/09/2014											
Sample Type	Ground Water	Ground Water											
Batch Number	1	1											
Date of Receipt	12/09/2014	12/09/2014											
Dissolved Calcium #	102.2	169.1									<0.2	mg/l	TM30/PM14
Total Dissolved Iron #	<20	1981									<20	ug/l	TM30/PM14
Dissolved Magnesium #	23.6	22.0									<0.1	mg/l	TM30/PM14
Dissolved Manganese #	50	2683									<2	ug/l	TM30/PM14
Dissolved Potassium #	7.5	5.2									<0.1	mg/l	TM30/PM14
Dissolved Sodium #	21.3	70.1									<0.1	mg/l	TM30/PM14
Total Phosphorus	315	97									<5	ug/l	TM30/PM14
EPH (C8-C40) #	<10	<10									<10	ug/l	TM5/PM30
C8-C40 Mineral Oil (Calculation)	<10	<10									<10	ug/l	TM5/PM30
Sulphate #	84.88	70.39									<0.05	mg/l	TM38/PM0
Chloride #	48.6	127.9									<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	1.3	<0.2									<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02									<0.02	mg/l	TM38/PM0
Ortho Phosphate as PO4 #	<0.06	<0.06									<0.06	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH4 #	<0.03	0.65									<0.03	mg/l	TM38/PM0
Total Ammonia as N #	<0.03	0.50									<0.03	mg/l	TM38/PM0
Total Alkalinity as CaCO3 #	280	398									<1	mg/l	TM75/PM0
Electrical Conductivity @25C #	755	1245									<2	uS/cm	TM76/PM0
Faecal Coliforms*	10	30										CFU/100ml	Subcontracted
Free Ammonia as NH3	<0.07	0.60									<0.07	mg/l	TM53/PM0
pH #	7.70	7.46									<0.01	pH units	TM73/PM0
Total Coliforms*	40	97										CFU/100ml	Subcontracted
Turbidity	0.9	1.1									<0.1	NTU	TM34/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: IE Consulting
Reference: IE912
Location: Naul
Contact: Aine McElhinney

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
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NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 14/10407

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It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

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As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

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SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
OC	Outside Calibration Range

JE Job No: 14/10407

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	In-House method based on USEPA 8015B. Determination of Extractable Petroleum Hydrocarbons (EPH) in the carbon chain length range of C8-40 by GC-FID. Accredited to ISO 17025 on soil and water samples and MCERTS (carbon banding only) on soils. All accreditation is matrix specific.	PM30	In-house method based on USEPA 3510. Liquid samples are mixed with solvent and agitated with an automatic magnetic stirrer with a stir bar for 15 minutes to extract organic molecules. ISO 17025 accredited extraction method. All accreditation is matrix specific				
TM5	In-House method based on USEPA 8015B. Determination of Extractable Petroleum Hydrocarbons (EPH) in the carbon chain length range of C8-40 by GC-FID. Accredited to ISO 17025 on soil and water samples and MCERTS (carbon banding only) on soils. All accreditation is matrix specific.	PM30	In-house method based on USEPA 3510. Liquid samples are mixed with solvent and agitated with an automatic magnetic stirrer with a stir bar for 15 minutes to extract organic molecules. ISO 17025 accredited extraction method. All accreditation is matrix specific	Yes			
TM30	Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry) using Thermo iCAP 6000 series instrument. Accredited to ISO 17025 for soils and waters and MCERTS accredited for Soils. All accreditation is matrix specific.	PM14	In-house method based on USEPA 3005A. Acid digestion of water samples and analsyis by ICP-OES as per method TM030W.ISO 17025 accredited extraction method. All accreditation is matrix specific				
TM30	Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry) using Thermo iCAP 6000 series instrument. Accredited to ISO 17025 for soils and waters and MCERTS accredited for Soils. All accreditation is matrix specific.	PM14	In-house method based on USEPA 3005A. Acid digestion of water samples and analsyis by ICP-OES as per method TM030W.ISO 17025 accredited extraction method. All accreditation is matrix specific	Yes			
TM34	Turbidity by Turbidimeter	PM0	No preparation is required.				
TM38	Ionic analysis using the Thermo Aquakem Photometric Automatic Analyser. Accredited to ISO17025 and MCERTS for most analytes. All accreditation is matrix specific.	PM0	No preparation is required.	Yes			
TM53	Ammonia by Colourimetric measurement	PM0	No preparation is required.				
TM73	pH in by Metrohm	PM0	No preparation is required.	Yes			
TM75	Alkalinity by Metrohm	PM0	No preparation is required.	Yes			
TM76	Electrical Conductivity by Metrohm	PM0	No preparation is required.	Yes			

JE Job No: 14/10407

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
Subcontracted	Subcontracted analysis, sent to an ISO 17025 accredited laboratory where possible.						

APPENDIX III

Appendix 3_Table 1
Clashford Recovery Facility, Naul, Co. Meath
Summary of 2009 Groundwater Chemistry Data

Sample Date	LAB ID	GW1 2009	GW Interim Guideline Value mg/l (Groundwater Assessment Criteria)
Parameters			
Alkalinity	n/a	230	no abnormal change
Ammoniacal Nitrogen	n/a	<0.08	0.15
Arsenic(mg/l)	++	*0.0006*	0.01
Barium(mg/l)	++	*0.029*	0.1
Boron	++	0.03	1
Cadmium(mg/l)#	**	*<0.0001*	0.005
Calcium	**	67	200
Chloride	**	19	30
Chromium (mg/l)#	**	*<0.001*	0.03
Conductivity(µS/cm @ 20'C)	**	417	1000
Copper	**	<0.05	0.03
Cyanide	n/a	<0.01	0.01
Dissolved Oxygen	n/a	5.8	no abnormal change
Fluoride	**	0.11	1
Iron#	**	0.13	0.2
Lead(mg/l)	**	*<0.002*	0.01
Magnesium	**	13	50
Manganese#	**	0.03	0.05
Mercury(mg/l)	++	*<0.00005*	0.001
Nickel(mg/l)	++	*0.005*	0.02
Nitrate	**	0.8	25
Nitrite	**	<0.2	0.1
pH	**	7.5	>=6.5 and <=9.5
Phosphate	**	<1	0.03
Phosphorus	n/a	<0.05	
Potassium	**	2	5
Residue on Evaporation @ 180'c	n/a	235	
Selenium(mg/l)	++	*0.0012*	
Silver	++	<0.01	
Sodium	**	20	150
Sulphate	**	16	200
Temperature	n/a	not recorded	25
TOC	n/a	1.2	no abnormal change
TON	n/a	<0.24	no abnormal change
Total phenols	n/a	<0.05	
Zinc#	**	0.02	0.1
Faecal Coliforms (cfu/100ml)	n/a	**>100**	0 counts per 100ml
Total Coliforms (cfu/100ml)	n/a	0	0 counts per 100ml

-' means no data available
** = INAB Accredited Tests
++ = Subcontracted Tests
n/a = Non-INAB Accredited Tests
Analysis of metals are performed on the filtered sample
bold - exceeds IGV
0.001 - Original lab results were in µg/L, and results shown are converted to mg/L

Appendix 3_Table 2
Clashford Recovery Facility, Naul, Co. Meath
Summary of 2014 Groundwater Chemistry Data

Sample Date	GW1 Aug 2014	GW2 Aug 2014	GW3 Aug 2014	GW4 Aug 2014	GW3 Sep 2014	GW4 Sep 2014	GW Interim Guideline Value mg/l (Groundwater Assessment Criteria)
Parameters							
Total Alkalinity as CaCO3 (mg/l)	226	278	270	230	0.9	0.5	no abnormal change
Ammoniacal Nitrogen as NH4 (mg/l)	<0.03	0.08	<0.03	**1.4**	<0.03	0.65	0.15
Dissolved Calcium (mg/l)	65.6	90.7	119.1	109.3	102.2	169.1	200
Chloride (mg/l)	18.9	25	**110.1**	**120.4**	**48.6**	**127.9**	30
Conductivity(uS/cm @ 20'C)	458	629	938	1140	755	1245	1000
Dissolved Iron (mg/l)	116	28	<20	154	<20	1981	0.2
Lead(mg/l)							0.01
Magnesium (mg/l)	13.1	22.9	30.7	19.5	23.6	22	50
Manganese (mg/l)	24	455	104	937	50	2683	0.05
Nitrate (mg/l)	0.6	0.7	0.2	0.4	1.3	<0.2	25
Nitrite (mg/l)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.1
pH	7.82	7.72	7.62	**10.64**	7.7	7.46	>=6.5 and <=9.5
Ortho Phosphate as PO4 (mg/l)	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.03
Total Phosphorus (µg/l)	22	34	460	54	315	97	
Dissolved Potassium (mg/l)	2.1	1.9	9.9	75.2	7.5	5.2	5
Dissolved Sodium (mg/l)	20.4	20.2	26.6	94.8	21.3	70.1	150
Sulphate (mg/l)	22.75	73.97	90.82	138.27	84.88	70.39	200
Turbidity NTU	0.3	0.3	0.5	0.5	0.9	0.1	
EPH (C8 - C40) (µg/l)	<10	<10	<10	<10	<10	<10	
C8 - C40 Mineral Oil (µg/l)	<10	<10	<10	<10	<10	<10	
Faecal Coliforms (cfu/100ml)	0	0	**>100**	**20**	**10**	**30**	0 counts per 100ml
Total Coliforms (cfu/100ml)	0	**3**	**>100**	**600**	**40**	**97**	0 counts per 100ml

bold - exceeds IGV

Appendix II: Groundwater Monitoring Well Logs

IE CONSULTING
WATER-ENVIRONMENTAL-CIVIL

IE CONSULTING
Innovation Centre,
Green Rd.,
Carlow.
Ph: 059-9133084
Fax: 059-9140499

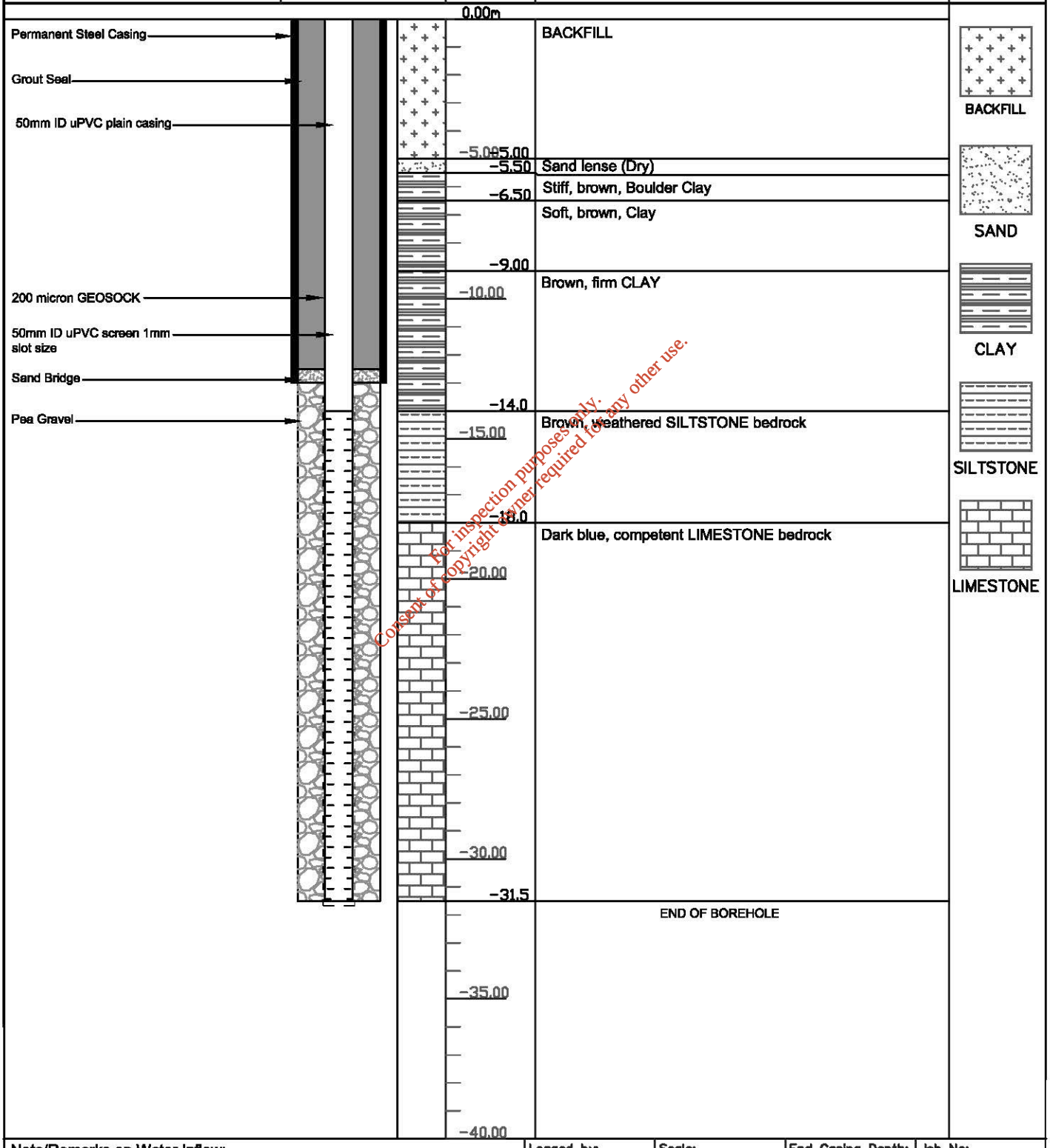
Borehole Log

GW3

Sheet 1 of 1

Method:	Date:	Site:
Rotary	29/07/14	Hydrogeological Assessment Naul, Co. Dublin

Dia.mm:	Coords:	G.L.mO.D.	Client:
100 OD	E313750: N261559	75.625mAOD	John Sheils



Note/Remarks on Water Inflow:

- Permanent Steel Casing from 0.0m to 13.0m, 50mm ID uPVC plain casing from 0.0m to 10.0m, 50mm ID uPVC screen 1mm slot size from 14.0m to 31.5m below ground.
- 200 micron GEOSOCK from 13.5m to 31.5m below ground.
- Grout Seal from 0.0m to 12.5m, Sand Bridge from 12.5m to 13.0m, Pea Gravel from 13.0m to 31.5m.

Logged by:	Scale:	End Casing Depth:	Job No:
A.M.	1/200	31.5m	IE912

IE CONSULTING
WATER-ENVIRONMENTAL-CIVIL

IE CONSULTING
Innovation Centre,
Green Rd.,
Carlow.
Ph: 059-9133084
Fax: 059-9140499

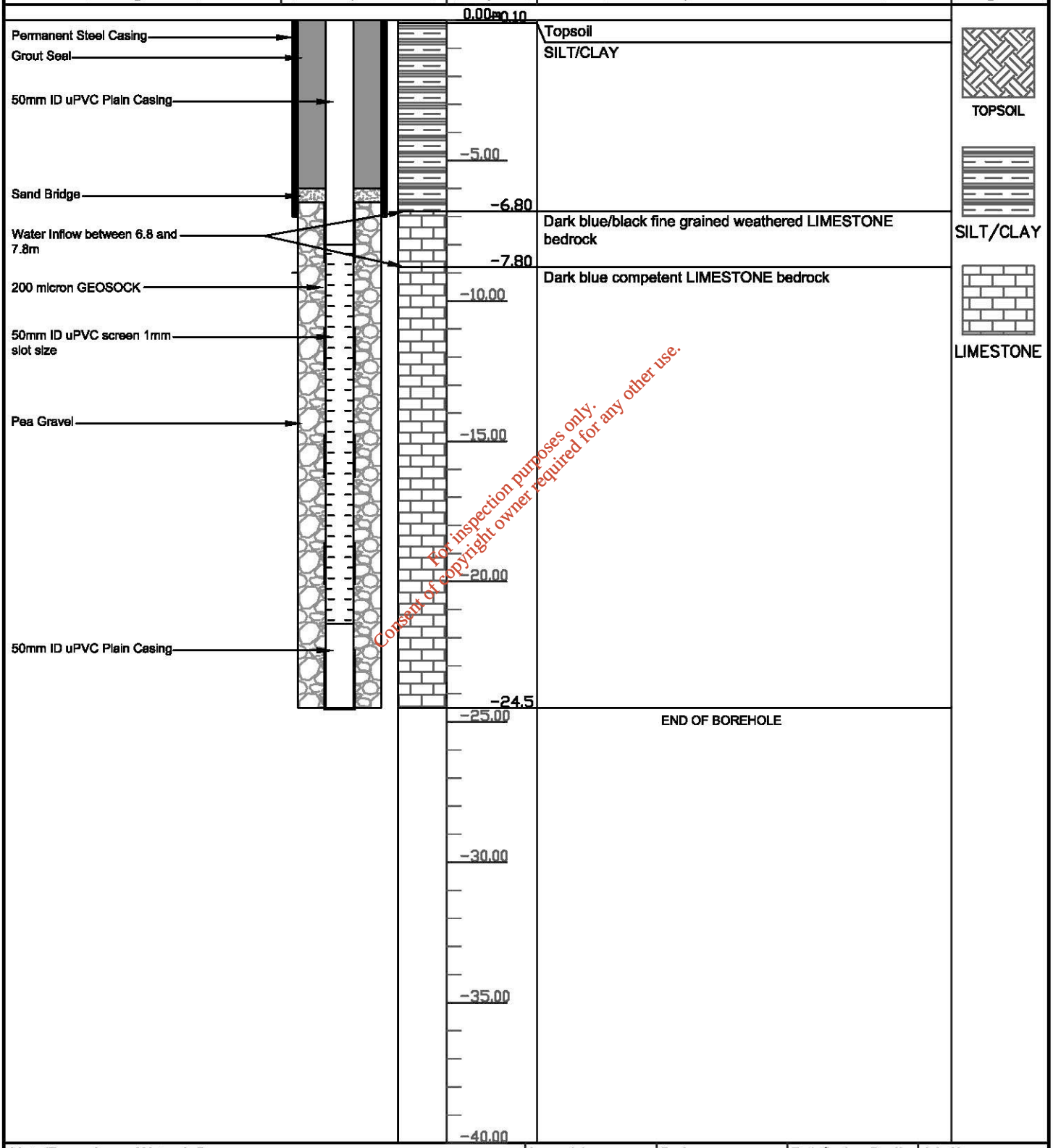
Borehole Log

GW4

Sheet 1 of 1

Method:	Date:	Site:
Rotary	28/07/14	Hydrogeological Assessment Naul, Co. Meath

Dia.mm:	Coords:	G.L.mO.D.	Client:
100 OD	E313506: N261440	49.334mAOD	John Sheils



Note/Remarks on Water Inflow:

- Permanent Steel Casing from 0.0m to 7.0m,50mm ID uPVC plain casing from 0.0m to 7.0m, 50mm ID uPVC screen 1mm slot size from 7.0m to 21.5m, 50mm ID uPVC plain casing from 21.5m to 24.5m below ground.
- 200 micron GEOSOCK from 6.5m to 24.5m below ground.
- Grout Seal from 0.0m to 6.0m, Sand Bridge from 6.0m to 6.5m, Pea Gravel from 6.5m to 24.5m.
- Water Inflow between 6.8m to 7.8m below ground.

Logged by:	Scale:	End Casing Depth:	Job No:
A.M.	1/200	24.5m	IE912

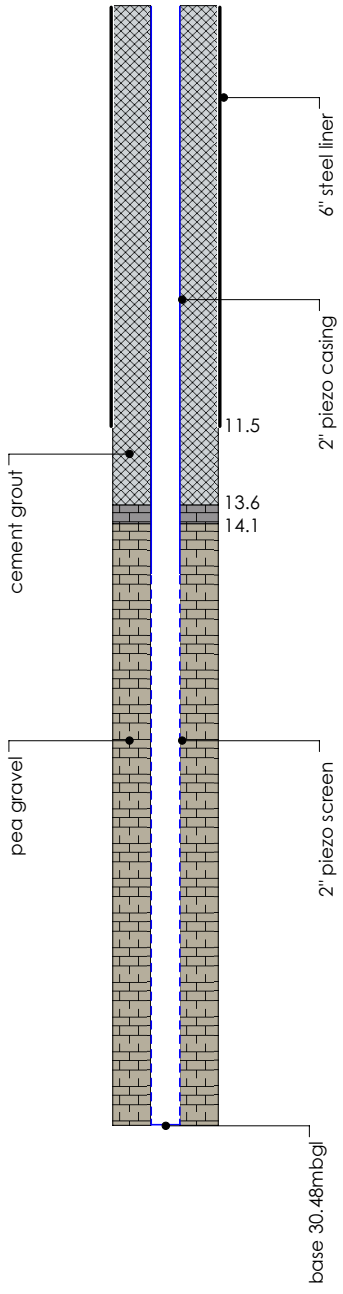
WATER WELL DRILLING LOG GW-5

WELL NUMBER: GW-5

PROJECT NUMBER: P1317-1
SITE: Clashford, The Naul, Co. Meath
CLIENT: Clashford Recovery Facility Ltd
DRILLING CONTRACTOR: O'Rourke Well Drilling

DATE STARTED: 04/08/2017
DATE FINISHED: 04/08/2017
LOGGED BY: M. Gill
FLUSH: Air

EASTING: 313952
NORTHING: 261950
ELEVATION: 57.62mOD
WELL DIA: 6", 2" install



Flush Colour	H2O Inject.	Water Strikes	Fractures	Airlift Q (gal/hr)	Comments	Elevation	Meters Below Ground Surface	Lithology	Formation Description
						57.62	0		Ground Surface
					8" drilling to 0-11.5mbgl, 6" drilling from 11.5 to 30.0mbgl Brown flush in weathered rock				Grey, brown sandy gravelly CLAY
						46.12	10		Weathered SILTSTONE Bedrock brown water flush
					water strike at 13.5mbgl				
					Airlifting 500-600gph, cleaning as airlifting accuring	39.32	15		Dark grey SILTSTONE with red and brown staining
					Softer rock between 21 and 24.4mbgl	36.32	20		
						34.72			Dark grey SILTSTONE with red and brown staining
					Airlifting 800gph increase in water between 20-30mbgl		25		Dark grey SILTSTONE
						27.14	30		Total Depth of Borehole
							35		

REMARKS:
Geosock installed over full lenght of well screen
water level after install - 8.80mbTOC uPVC pipe

PAGE 1 of 1

SCALE As shown

HYDRO-ENVIRONMENTAL SERVICES 22 Lower Main Street Dungarvan Co. Waterford Tel: 058-44122 Fax: 058-44244 Email: info@hydroenvironmental.ie

Appendix III: Original Groundwater and Surface Water Laboratory Reports

Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

Hydro-Environmental Services
22 Lower Main Street
Dungarvan
Co Waterford

4225

Attention :	Michael Gill
Date :	28th September, 2017
Your reference :	P1317-1
Our reference :	Test Report 17/15401 Batch 1
Location :	Clashford
Date samples received :	14th September, 2017
Status :	Final report
Issue :	1

Nine samples were received for analysis on 14th September, 2017 of which nine were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Phil Sommerton BSc
Project Manager

Client Name: Hydro-Environmental Services
Reference: P1317-1
Location: Clashford
Contact: Michael Gill
JE Job No.: 17/15401

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-6	7-12	13-18	19-24	25-30	31-35	36-40	41-45	46-50		LOD/LOR	Units	Method No.
Sample ID	P1317-1-SW1	P1317-1-SW2	P1317-1-SW3	P1317-1-SW4	P1317-1-SW5	P1317-1-GW2	P1317-1-GW3	P1317-1-GW4	P1317-1-GW5				
Depth													
COC No / misc													
Containers	V H HN N P G	V H HN N P G	V H HN N P G	V H HN N P G	V H HN N P G	V H HN P G	V H HN P G	V H HN P G	V H HN P G				
Sample Date	12/09/2017	12/09/2017	12/09/2017	12/09/2017	12/09/2017	12/09/2017	12/09/2017	12/09/2017	12/09/2017				
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Ground Water	Ground Water	Ground Water	Ground Water				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	14/09/2017	14/09/2017	14/09/2017	14/09/2017	14/09/2017	14/09/2017	14/09/2017	14/09/2017	14/09/2017				
Dissolved Arsenic #	<2.5	<2.5	<2.5	<2.5	2.6	<2.5	<2.5	5.3	<2.5		<2.5	ug/l	TM30/PM14
Dissolved Barium #	31	31	19	28	29	46	47	108	81		<3	ug/l	TM30/PM14
Dissolved Boron	46	39	39	21	24	32	57	26	33		<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM30/PM14
Dissolved Calcium #	118.2	116.5	118.1	86.5	87.6	78.1	130.4	147.2	101.0		<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5		<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7	<7	<7	<7	<7	<7	<7		<7	ug/l	TM30/PM14
Total Dissolved Iron #	52	27	27	39	40	188	<20	4157	<20		<20	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM30/PM14
Dissolved Magnesium #	9.6	9.9	10.2	8.9	8.9	19.2	30.1	17.7	17.4		<0.1	mg/l	TM30/PM14
Dissolved Manganese #	49	39	24	53	54	395	64	2219	52		<2	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	<1	<1	<1	-	-	-	-		<1	ug/l	TM30/PM14
Dissolved Nickel #	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM30/PM14
Dissolved Phosphorus #	91	131	126	63	57	-	-	-	-		<5	ug/l	TM30/PM14
Dissolved Potassium #	4.0	4.5	4.4	3.2	3.2	1.5	8.3	3.1	3.7		<0.1	mg/l	TM30/PM14
Dissolved Selenium #	<3	<3	<3	<3	<3	-	-	-	-		<3	ug/l	TM30/PM14
Dissolved Silver	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM30/PM14
Dissolved Sodium #	12.2	13.8	14.0	14.7	14.9	18.7	23.6	35.0	28.0		<0.1	mg/l	TM30/PM14
Dissolved Zinc #	<3	<3	<3	<3	<3	<3	<3	<3	17		<3	ug/l	TM30/PM14
Total Phosphorus	-	-	-	-	-	35	41	52	62		<5	ug/l	TM30/PM14
EPH (C8-C40) #	-	-	-	-	-	<10	<10	<10	<10		<10	ug/l	TM5/PM30
C8-C40 Mineral Oil (Calculation)	-	-	-	-	-	<10	<10	<10	<10		<10	ug/l	TM5/PM30
Phenol #	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-		<0.01	mg/l	TM26/PM0
Fluoride	<0.3	<0.3	<0.3	<0.3	<0.3	-	-	-	-		<0.3	mg/l	TM173/PM0
Sulphate as SO4 #	36.0	37.6	35.1	26.4	27.9	48.6	177.4	36.0	44.7		<0.5	mg/l	TM38/PM0
Chloride #	27.1	27.9	27.8	28.5	28.4	27.4	60.9	102.3	51.3		<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	5.4	4.8	4.7	14.5	14.4	<0.2	<0.2	2.0	0.5		<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	0.06	0.06	<0.02	<0.02	<0.02	<0.02	0.04	0.15		<0.02	mg/l	TM38/PM0
Ortho Phosphate as PO4	0.21	0.33	0.32	0.13	0.13	<0.03	<0.03	<0.03	0.06		<0.03	mg/l	TM38/PM0
Total Oxidised Nitrogen as N #	1.2	1.1	1.1	3.3	3.3	<0.2	<0.2	0.5	<0.2		<0.2	mg/l	TM38/PM0
Total Cyanide #	<0.01	<0.01	<0.01	<0.01	<0.01	-	-	-	-		<0.01	mg/l	TM89/PM0
Ammoniacal Nitrogen as N #	0.04	0.16	0.05	0.05	0.05	-	-	-	-		<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH4 #	-	-	-	-	-	0.06	<0.03	0.24	0.08		<0.03	mg/l	TM38/PM0
Total Alkalinity as CaCO3 #	332	324	330	256	268	286	292	372	310		<1	mg/l	TM75/PM0
Dissolved Oxygen	9	10	10	10	10	-	-	-	-		<1	mg/l	TM59/PM0
Electrical Conductivity @25C #	638	610	627	491	505	559	877	938	<2		<2	uS/cm	TM76/PM0

Client Name: Hydro-Environmental Services
Reference: P1317-1
Location: Clashford
Contact: Michael Gill
JE Job No.: 17/15401

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-6	7-12	13-18	19-24	25-30	31-35	36-40	41-45	46-50		LOD/LOR	Units	Method No.
Sample ID	P1317-1-SW1	P1317-1-SW2	P1317-1-SW3	P1317-1-SW4	P1317-1-SW5	P1317-1-GW2	P1317-1-GW3	P1317-1-GW4	P1317-1-GW5				
Depth										Please see attached notes for all abbreviations and acronyms			
COC No / misc													
Containers	V H HN N P G	V H HN N P G	V H HN N P G	V H HN N P G	V H HN N P G	V H HN P G	V H HN P G	V H HN P G	V H HN P G				
Sample Date	12/09/2017	12/09/2017	12/09/2017	12/09/2017	12/09/2017	12/09/2017	12/09/2017	12/09/2017	12/09/2017				
Sample Type	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water	Ground Water	Ground Water	Ground Water	Ground Water				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	14/09/2017	14/09/2017	14/09/2017	14/09/2017	14/09/2017	14/09/2017	14/09/2017	14/09/2017	14/09/2017				
pH #	7.96	8.00	7.94	8.03	8.00	-	-	-	-		<0.01	pH units	TM73/PM0
Total Organic Carbon #	3	4	4	4	3	<2	2	3	<2		<2	mg/l	TM60/PM0
Total Solids #	406	405	412	326	317	-	-	-	-		<5	mg/l	TM20/PM0
Turbidity	-	-	-	-	-	1.4	1.9	3.9	0.8		<0.1	NTU	TM34/PM0
Total Cations	7.32	7.34	7.45	5.77	-	6.33	10.22	10.40	7.79		<0.00	mmolc/l	TM30/PM14
Total Anions	8.24	8.13	8.19	6.71	-	7.50	11.25	11.11	8.58		<0.00	mmolc/l	TM0/PM0
% Cation Excess	-5.91	-5.11	-4.73	-7.53	-	-8.46	-4.80	-3.30	-4.83			%	TM0/PM0

Client Name: Hydro-Environmental Services

Reference: P1317-1

Location: Clashford

Contact: Michael Gill

Matrix : Liquid

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
17/15401	1					Liquid Samples were received at a temperature above 9°C.

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 17/15401

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory.

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters, the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS) accredited - UK.
SA	ISO17025 (SANAS) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

JE Job No: 17/15401

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM0	Not available	PM0	No preparation is required.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.	Yes			
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM34	Turbidity by 2100P Turbidity Meter	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			

JE Job No: 17/15401

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM59	Determination of Dissolved Oxygen using the Hach HQ30D Oxygen Meter	PM0	No preparation is required.				
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.	Yes			
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM0	No preparation is required.	Yes			
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.				

ALS Life Sciences Ltd
Trading as ALS
Carrigeen Business Park, Clonmel, Co. Tipperary
Tel: +353 (0) 52 617 8100
Fax:+353 (0) 52 617 8103
www.alsglobal.ie

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.166T

Report No: HYDR-474120917
Document No: EF0011

CERTIFICATE OF ANALYSIS

Client **Hydro Environmental Services**
22 Lower Main Street
Dungarvan
Co. Waterford

Date Received 12/09/2017
Date Reported 13/09/2017
Order Number N/A

For the Attention of: Hydro Environmental Services

Sample Reception 4 sample(s) received in good condition.

Comments N/A

Note: A # next to the result indicates that there was insufficient sample to carry out testing as per SOP .

Report Authorised by: Olwen Maher

Olwen Maher
Deputy Microbiology Manager

Conditions:
1. *Results in this report relate only to the items tested*
2. *Reports may not be reproduced except in full without the approval of ALS Life Sciences Ltd*
3. *All queries regarding this report should be addressed to the Technical Manager at the above address*
4. *A * next to a method reference signifies that ALS Life Sciences Ltd is NOT INAB accredited for this method*
5. *Results reported as CFU/cm^2 are calculated based on information supplied by customer regarding area swabbed*
6. *CFU indicates Colony Forming Units, MPN indicates Most Probable Number*
7. SUBCON* indicates analysis subcontracted to approved subcontractors who do not hold accreditation for this test
8. SUBCON^ indicates analysis subcontracted to approved subcontractors who hold accreditation for this test

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Report No: HYDR-474120917

Document No: EF0011

CERTIFICATE OF ANALYSIS

Date Received 12/09/2017
Date Reported 13/09/2017
Order Number N/A

Sample Type Water
Client ID P1317-1 - GW2 Date sampled: 12.09.2017 @ 11.00am
Date Tested 12/09/2017
ALS ID 2819365

Test	Result	Unit	Method
Coliforms	0	MPN/100ml	SP 196 Based on ISO 9308-2 (2012)
Faecal coliforms	0	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit.

Sample Type Water
Client ID P1317-1 - GW3 Date sampled: 12.09.2017 @ 11.00am
Date Tested 12/09/2017
ALS ID 2819366

Test	Result	Unit	Method
Coliforms	0	MPN/100ml	SP 196 Based on ISO 9308-2 (2012)
Faecal coliforms	0	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit.

Sample Type Water
Client ID P1317-1 - GW4 Date sampled: 12.09.2017 @ 11.00am
Date Tested 12/09/2017
ALS ID 2819367

Test	Result	Unit	Method
Coliforms	0	MPN/100ml	SP 196 Based on ISO 9308-2 (2012)
Faecal coliforms	0	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit.

Sample Type Water
Client ID P1317-1 - GW5 Date sampled: 12.09.2017 @ 11.00am
Date Tested 12/09/2017
ALS ID 2819368

Test	Result	Unit	Method
Coliforms	0	MPN/100ml	SP 196 Based on ISO 9308-2 (2012)
Faecal coliforms	0	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit.

Report Authorised by: Olwen Maher

Olwen Maher
Deputy Microbiology Manager

Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

Hydro-Environmental Services
22 Lower Main Street
Dungarvan
Co Waterford

4225

Attention :	Michael Gill
Date :	5th April, 2018
Your reference :	P1317-7
Our reference :	Test Report 18/4030 Batch 1
Location :	Clashford
Date samples received :	16th March, 2018
Status :	Final report
Issue :	1

Ten samples were received for analysis on 16th March, 2018 of which ten were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Bruce Leslie
Project Co-ordinator

Client Name: Hydro-Environmental Services
Reference: P1317-7
Location: Clashford
Contact: Michael Gill
JE Job No.: 18/4030

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-10	11-20	21-30	31-40	41-48	49-58	59-68	69-78	79-88	89-98	LOD/LOR	Units	Method No.
Sample ID	GW1	GW2	GW3	GW4	GW5	SW1	SW2	SW3	SW4	SW5			
Depth													
COC No / misc													
Containers	V H HN N P G	V H HN N P G	V H HN N P G	V H HN N P G	H HN N P G	V H HN N P G	V H HN N P G	V H HN N P G	V H HN N P G	V H HN N P G			
Sample Date	13/03/2018	13/03/2018	13/03/2018	13/03/2018	13/03/2018	13/03/2018	13/03/2018	13/03/2018	13/03/2018	13/03/2018			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	16/03/2018	16/03/2018	16/03/2018	16/03/2018	16/03/2018	16/03/2018	16/03/2018	16/03/2018	16/03/2018	16/03/2018			
Dissolved Arsenic #	2.7	7.1	2.9	15.7	<2.5	3.4	4.1	5.3	2.9	4.0	<2.5	ug/l	TM30/PM14
Dissolved Barium #	20	45	41	126	49	40	37	37	29	30	<3	ug/l	TM30/PM14
Dissolved Boron	<12	<12	25	21	14	23	17	<12	<12	<12	<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ug/l	TM30/PM14
Dissolved Calcium #	48.3	77.6	114.6	180.5	64.3	111.1	111.9	110.8	78.5	88.8	<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	ug/l	TM30/PM14
Total Dissolved Iron #	35	559	<20	5224	201	<20	<20	<20	24	<20	<20	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Magnesium #	13.4	19.9	29.8	30.9	16.9	7.9	8.0	7.8	7.3	8.2	<0.1	mg/l	TM30/PM14
Dissolved Manganese #	501	396	49	2273	129	35	38	44	64	55	<2	ug/l	TM30/PM14
Dissolved Mercury #	-	-	-	-	-	<1	<1	<1	<1	<1	<1	ug/l	TM30/PM14
Dissolved Nickel #	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	ug/l	TM30/PM14
Dissolved Phosphorus #	-	-	-	-	-	40	44	45	35	37	<5	ug/l	TM30/PM14
Dissolved Potassium #	2.7	1.6	7.8	6.5	2.0	2.2	2.2	2.4	2.6	3.5	<0.1	mg/l	TM30/PM14
Dissolved Selenium #	-	-	-	-	-	<3	<3	<3	<3	<3	<3	ug/l	TM30/PM14
Dissolved Silver	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	ug/l	TM30/PM14
Dissolved Sodium #	18.5	18.3	28.2	74.3	20.7	12.4	12.4	12.4	12.6	14.6	<0.1	mg/l	TM30/PM14
Dissolved Zinc #	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3	ug/l	TM30/PM14
Total Phosphorus	35	21	44	206	119	-	-	-	-	-	<5	ug/l	TM30/PM14
EPH (C8-C40) #	<10	<10	<10	<10	<10	-	-	-	-	-	<10	ug/l	TM5/PM30
Phenol #	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l	TM26/PM0
Fluoride	-	-	-	-	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	mg/l	TM173/PM0
Sulphate as SO4 #	16.3	48.0	110.6	35.7	23.5	34.9	34.3	33.4	24.4	32.5	<0.5	mg/l	TM38/PM0
Chloride #	18.0	26.1	67.5	223.2	57.5	29.3	30.4	29.7	32.6	34.1	<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	<0.2	<0.2	1.0	<0.2	<0.2	14.2	14.0	13.5	21.7	21.3	<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02	<0.02	<0.02	<0.02	<0.02	0.11	0.12	0.14	0.10	0.10	<0.02	mg/l	TM38/PM0
Ortho Phosphate as PO4	<0.03	<0.03	<0.03	<0.03	<0.03	0.10	0.13	0.13	0.08	0.09	<0.03	mg/l	TM38/PM0
Total Oxidised Nitrogen as N #	<0.2	<0.2	0.2	<0.2	<0.2	3.2	3.2	3.1	4.9	4.8	<0.2	mg/l	TM38/PM0
Total Cyanide #	-	-	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/l	TM89/PM0
Ammoniacal Nitrogen as N #	-	-	-	-	-	0.07	0.08	0.08	0.09	0.09	<0.03	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH4 #	0.57	0.05	<0.03	1.30	0.06	-	-	-	-	-	<0.03	mg/l	TM38/PM0
Total Alkalinity as CaCO3 #	198	248	216	368	220	290	298	292	184	162	<1	mg/l	TM75/PM0
Dissolved Oxygen	-	-	-	-	-	11	11	11	11	11	<1	mg/l	TM59/PM0
Electrical Conductivity @25C #	405	580	869	1417	507	661	674	658	515	541	<2	uS/cm	TM76/PM0
pH #	-	-	-	-	-	7.73	7.78	7.84	7.51	7.44	<0.01	pH units	TM73/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Hydro-Environmental Services
Reference: P1317-7
Location: Clashford
Contact: Michael Gill
JE Job No.: 18/4030

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

J E Sample No.	1-10	11-20	21-30	31-40	41-48	49-58	59-68	69-78	79-88	89-98	LOD/LOR	Units	Method No.
Sample ID	GW1	GW2	GW3	GW4	GW5	SW1	SW2	SW3	SW4	SW5			
Depth													
COC No / misc													
Containers	V H HN N P G	V H HN N P G	V H HN N P G	V H HN N P G	H HN N P G	V H HN N P G	V H HN N P G	V H HN N P G	V H HN N P G	V H HN N P G			
Sample Date	13/03/2018	13/03/2018	13/03/2018	13/03/2018	13/03/2018	13/03/2018	13/03/2018	13/03/2018	13/03/2018	13/03/2018			
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Surface Water	Surface Water	Surface Water	Surface Water	Surface Water			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	16/03/2018	16/03/2018	16/03/2018	16/03/2018	16/03/2018	16/03/2018	16/03/2018	16/03/2018	16/03/2018	16/03/2018			
Total Organic Carbon #	<2	<2	3	10	<2	5	4	4	3	4	<2	mg/l	TM60/PM0
Total Solids #	-	-	-	-	-	421	480	424	336	376	<5	mg/l	TM20/PM0
Turbidity	33.3	4.8	6.7	76.1	149.0	-	-	-	-	-	<0.1	NTU	TM34/PM0
Total Cations	4.39	6.35	9.60	14.95	5.55	6.79	6.84	6.77	5.13	5.83	<0.00	mmolc/l	TM30/PM14
Total Anions	4.81	6.69	8.54	14.40	6.51	7.58	7.76	7.59	5.46	5.22	<0.00	mmolc/l	TM0/PM0
% Cation Excess	-4.57	-2.61	5.84	1.87	-7.96	-5.50	-6.30	-5.71	-3.12	5.52		%	TM0/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Hydro-Environmental Services
Reference: P1317-7
Location: Clashford
Contact: Michael Gill

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 18/4030						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 18/4030

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

JE Job No: 18/4030

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM0	Not available	PM0	No preparation is required.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes			
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.	Yes			
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM34	Turbidity by 2100P Turbidity Meter	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM59	Determination of Dissolved Oxygen using the Hach HQ30D Oxygen Meter	PM0	No preparation is required.				

JE Job No: 18/4030

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.	Yes			
TM73	Modified US EPA methods 150.1 and 9045D and BS1377:1990. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser. Where WAD cyanides are required a Ligand displacement step is carried out before analysis.	PM0	No preparation is required.	Yes			
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.				

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Report No: HYDR-507140318
Document No: EF0011

SUPPLEMENTARY CERTIFICATE OF ANALYSIS

Client **Hydro Environmental Services**
22 Lower Main Street
Dungarvan
Co. Waterford

Date Received 14/03/2018
Date Reported 16/03/2018
Order Number N/A

For the Attention of: Hydro Environmental Services

Sample Reception 10 sample(s) received in good condition.

Comments N/A

Note: A # next to the result indicates that there was insufficient sample to carry out testing as per SOP .

Report Authorised by: Mairead Gilmore

Mairead Gilmore
Deputy Microbiology Manager

Conditions:
1. *Results in this report relate only to the items tested*
2. *Reports may not be reproduced except in full without the approval of ALS Life Sciences Ltd*
3. *All queries regarding this report should be addressed to the Technical Manager at the above address*
4. *A * next to a method reference signifies that ALS Life Sciences Ltd is NOT INAB accredited for this method*
5. *Results reported as CFU/cm^2 are calculated based on information supplied by customer regarding area swabbed*
6. *CFU indicates Colony Forming Units, MPN indicates Most Probable Number*
7. SUBCON* indicates analysis subcontracted to approved subcontractors who do not hold accreditation for this test
8. SUBCON^ indicates analysis subcontracted to approved subcontractors who hold accreditation for this test

9. This supplementary certificate replaces the previous certificate which must be destroyed

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Report No: HYDR-507140318

Document No: EF0011

SUPPLEMENTARY CERTIFICATE OF ANALYSIS

Date Received 14/03/2018
Date Reported 16/03/2018
Order Number N/A

Sample Type Water
Client ID Clashford SW1
Date Tested 14/03/2018
ALS ID 3017199

Test	Result	Unit	Method
Coliforms	687	MPN/100ml	SP 196 Based on ISO 9308-2 (2012)
Faecal coliforms	326	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit.

Sample Type Water
Client ID Clashford SW2
Date Tested 14/03/2018
ALS ID 3017200

Test	Result	Unit	Method
Coliforms	1986	MPN/100ml	SP 196 Based on ISO 9308-2 (2012)
Faecal coliforms	816	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit.

Sample Type Water
Client ID Clashford SW3
Date Tested 14/03/2018
ALS ID 3017201

Test	Result	Unit	Method
Coliforms	1413	MPN/100ml	SP 196 Based on ISO 9308-2 (2012)
Faecal coliforms	980	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit.

Sample Type Water
Client ID Clashford SW4
Date Tested 14/03/2018
ALS ID 3017202

Test	Result	Unit	Method
Coliforms	1300	MPN/100ml	SP 196 Based on ISO 9308-2 (2012)
Faecal coliforms	147	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit.

Report Authorised by:

Mairead Gilmore
Deputy Microbiology Manager

ALS Life Sciences Ltd
Trading as ALS
Carrigeen Business Park, Clonmel, Co. Tipperary
Tel: +353 (0) 52 617 8100
Fax:+353 (0) 52 617 8103
www.alsglobal.ie

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.166T

Report No: HYDR-507140318

Document No: EF0011

SUPPLEMENTARY CERTIFICATE OF ANALYSIS

Date Received 14/03/2018
Date Reported 16/03/2018
Order Number N/A

Sample Type Water
Client ID Clashford SW5
Date Tested 14/03/2018
ALS ID 3017203

Test	Result	Unit	Method
Coliforms	687	MPN/100ml	SP 196 Based on ISO 9308-2 (2012)
Faecal coliforms	68	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit.

Sample Type Water
Client ID Clashford GW1
Date Tested 14/03/2018
ALS ID 3017204

Test	Result	Unit	Method
Coliforms	0	MPN/100ml	SP 196 Based on ISO 9308-2 (2012)
Faecal coliforms	0	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit.

Sample Type Water
Client ID Clashford GW2
Date Tested 14/03/2018
ALS ID 3017205

Test	Result	Unit	Method
Coliforms	0	MPN/100ml	SP 196 Based on ISO 9308-2 (2012)
Faecal coliforms	0	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit.

Sample Type Water
Client ID Clashford GW3
Date Tested 14/03/2018
ALS ID 3017206

Test	Result	Unit	Method
Coliforms	0	MPN/100ml	SP 196 Based on ISO 9308-2 (2012)
Faecal coliforms	0	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit.

Report Authorised by:

Mairead Gilmore
Deputy Microbiology Manager

ALS Life Sciences Ltd
Trading as ALS
Carrigeen Business Park, Clonmel, Co. Tipperary
Tel: +353 (0) 52 617 8100
Fax:+353 (0) 52 617 8103
www.alsglobal.ie

Report No: HYDR-507140318

Document No: EF0011

SUPPLEMENTARY CERTIFICATE OF ANALYSIS

Date Received 14/03/2018
Date Reported 16/03/2018
Order Number N/A

Sample Type Water
Client ID Clashford GW4
Date Tested 14/03/2018
ALS ID 3017207

Test	Result	Unit	Method
Coliforms	0	MPN/100ml	SP 196 Based on ISO 9308-2 (2012)
Faecal coliforms	0	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit.

Sample Type Water
Client ID Clashford GW5
Date Tested 14/03/2018
ALS ID 3017208

Test	Result	Unit	Method
Coliforms	0	MPN/100ml	SP 196 Based on ISO 9308-2 (2012)
Faecal coliforms	0	MPN/100ml	SP 200 based on the IDEXX Colilert 18 test kit.

Report Authorised by:

Mairead Gilmore
Deputy Microbiology Manager

ALS Life Sciences Ltd
Trading as ALS
Carrigeen Business Park, Clonmel, Co. Tipperary
Tel: +353 (0) 52 617 8100
Fax:+353 (0) 52 617 8103
www.alsglobal.ie

ISO 17025 INAB ACCREDITED TESTING DETAILED IN SCOPE REG NO.166T

Report No: HYDR-505140318
Document No: EF0011

SUPPLEMENTARY CERTIFICATE OF ANALYSIS

Client **Hydro Environmental Services**
22 Lower Main Street
Dungarvan
Co. Waterford

Date Received 14/03/2018
Date Reported 23/03/2018
Order Number N/A

For the Attention of: Hydro Environmental Services

Sample Reception 10 sample(s) received in good condition.

Comments N/A

Note: A # next to the result indicates that there was insufficient sample to carry out testing as per SOP .

Report Authorised by: Rosemary Thomas

Rosemary Thomas
Environmental Chemistry Manager

Conditions:
1. *Results in this report relate only to the items tested*
2. *Reports may not be reproduced except in full without the approval of ALS Life Sciences Ltd*
3. *All queries regarding this report should be addressed to the Technical Manager at the above address*
4. *A * next to a method reference signifies that ALS Life Sciences Ltd is NOT INAB accredited for this method*
5. *Results reported as CFU/cm^2 are calculated based on information supplied by customer regarding area swabbed*
6. *CFU indicates Colony Forming Units, MPN indicates Most Probable Number*
7. SUBCON* indicates analysis subcontracted to approved subcontractors who do not hold accreditation for this test
8. SUBCON^ indicates analysis subcontracted to approved subcontractors who hold accreditation for this test

9. This supplementary certificate replaces the previous certificate which must be destroyed

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Fax:+353 (0) 52 617 8103
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Report No: HYDR-505140318
Document No: EF0011

SUPPLEMENTARY CERTIFICATE OF ANALYSIS

Date Received 14/03/2018
Date Reported 23/03/2018
Order Number N/A

Sample Type Water
Client ID Clashford SW1
Date Tested 15/03/2018
ALS ID 3017187

Test	Result	Unit	Method
BOD 5 day Total with ATU	<2	mg/l O2	P280

Sample Type Water
Client ID Clashford SW2
Date Tested 15/03/2018
ALS ID 3017188

Test	Result	Unit	Method
BOD 5 day Total with ATU	<1	mg/l O2	P280

Sample Type Water
Client ID Clashford SW3
Date Tested 15/03/2018
ALS ID 3017189

Test	Result	Unit	Method
BOD 5 day Total with ATU	<1	mg/l O2	P280

Sample Type Water
Client ID Clashford SW4
Date Tested 15/03/2018
ALS ID 3017190

Test	Result	Unit	Method
BOD 5 day Total with ATU	<1	mg/l O2	P280

Sample Type Water
Client ID Clashford SW5
Date Tested 15/03/2018
ALS ID 3017191

Test	Result	Unit	Method
BOD 5 day Total with ATU	<1	mg/l O2	P280

Report Authorised by: Rosemary Thomas

Rosemary Thomas
Environmental Chemistry Manager

ALS Life Sciences Ltd
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Tel: +353 (0) 52 617 8100
Fax:+353 (0) 52 617 8103
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Report No: HYDR-505140318

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SUPPLEMENTARY CERTIFICATE OF ANALYSIS

Date Received 14/03/2018
Date Reported 23/03/2018
Order Number N/A

Sample Type Water
Client ID Clashford GW1
Date Tested 15/03/2018
ALS ID 3017192

Test	Result	Unit	Method
BOD 5 day Total with ATU	2	mg/l O2	P280

Sample Type Water
Client ID Clashford GW2
Date Tested 15/03/2018
ALS ID 3017193

Test	Result	Unit	Method
BOD 5 day Total with ATU	<1	mg/l O2	P280

Sample Type Water
Client ID Clashford GW3
Date Tested 15/03/2018
ALS ID 3017194

Test	Result	Unit	Method
BOD 5 day Total with ATU	<1	mg/l O2	P280

Sample Type Water
Client ID Clashford GW4
Date Tested 15/03/2018
ALS ID 3017195

Test	Result	Unit	Method
BOD 5 day Total with ATU	<2	mg/l O2	P280

Sample Type Water
Client ID Clashford GW5
Date Tested 15/03/2018
ALS ID 3017196

Test	Result	Unit	Method
BOD 5 day Total with ATU	2	mg/l O2	P280

Report Authorised by: Rosemary Thomas

Rosemary Thomas
Environmental Chemistry Manager

Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

Hydro-Environmental Services
22 Lower Main Street
Dungarvan
Co Waterford

4225

Attention :	Michael Gill
Date :	18th June, 2018
Your reference :	P1317-2
Our reference :	Test Report 18/6842 Batch 1
Location :	Clashford The Naul Co Dublin
Date samples received :	3rd May, 2018
Status :	Final report
Issue :	2.2

One sample was received for analysis on 3rd May, 2018 of which one was scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Lucas Halliwell
Project Co-ordinator

Client Name: Hydro-Environmental Services
Reference: P1317-2
Location: Clashford The Naul Co Dublin
Contact: Michael Gill
JE Job No.: 18/6842

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	28-37										LOD/LOR	Units	Method No.
Sample ID	GW4												
Depth													
COC No / misc													
Containers	V H HN N P G												
Sample Date	01/05/2018												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	03/05/2018												
Dissolved Arsenic #	16.7										<2.5	ug/l	TM30/PM14
Dissolved Barium #	184										<3	ug/l	TM30/PM14
Dissolved Boron	44										<12	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5										<0.5	ug/l	TM30/PM14
Dissolved Calcium #	191.4										<0.2	mg/l	TM30/PM14
Total Dissolved Chromium #	2.4										<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7										<7	ug/l	TM30/PM14
Total Dissolved Iron #	6015										<20	ug/l	TM30/PM14
Dissolved Lead #	<5										<5	ug/l	TM30/PM14
Dissolved Magnesium #	28.4										<0.1	mg/l	TM30/PM14
Dissolved Manganese #	2914										<2	ug/l	TM30/PM14
Dissolved Nickel #	<2										<2	ug/l	TM30/PM14
Dissolved Potassium #	1.4										<0.1	mg/l	TM30/PM14
Dissolved Silver	<5										<5	ug/l	TM30/PM14
Dissolved Sodium #	76.8										<0.1	mg/l	TM30/PM14
Dissolved Zinc #	4										<3	ug/l	TM30/PM14
Total Phosphorus	272										<5	ug/l	TM30/PM14
EPH (C8-C40) #	<10										<10	ug/l	TM5/PM30
C8-C40 Mineral Oil (Calculation)	<10										<10	ug/l	TM5/PM30
Sulphate as SO4 #	38.6										<0.5	mg/l	TM38/PM0
Chloride #	210.4										<0.3	mg/l	TM38/PM0
Nitrate as NO3 #	0.3										<0.2	mg/l	TM38/PM0
Nitrite as NO2 #	<0.02										<0.02	mg/l	TM38/PM0
Ortho Phosphate as PO4	<0.03										<0.03	mg/l	TM38/PM0
Total Oxidised Nitrogen as N #	<0.2										<0.2	mg/l	TM38/PM0
Ammoniacal Nitrogen as NH4 #	1.99										<0.03	mg/l	TM38/PM0
Total Alkalinity as CaCO3 #	430										<1	mg/l	TM75/PM0
Electrical Conductivity @25C #	1313										<2	uS/cm	TM76/PM0
Total Organic Carbon #	8										<2	mg/l	TM60/PM0
Turbidity	80.8										<0.1	NTU	TM34/PM0

Client Name: Hydro-Environmental Services

Reference: P1317-2

Location: Clashford The Naul Co Dublin

Contact: Michael Gill

Matrix : Liquid

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
18/6842	1	-	-	-	Samples : 28-37	Liquid Samples were received at a temperature above 9°C.

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 18/6842

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to an Exova Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

JE Job No: 18/6842

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes

JE Job No: 18/6842

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid or water samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes

JE Job No: 18/6842

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM17	Modified method EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.	Yes		AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM62	Acid digestion of as received solid samples using Aqua Regia refluxed at 112.5 °C.			AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM34	Turbidity by 2100P Turbidity Meter	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes		AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.	Yes			

JE Job No: 18/6842

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.			AR	Yes
TM61	Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence.	PM38	Samples are brominated to reduce all mercury compounds to Mercury (II) which is analysed using method TM061.	Yes		AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes		AD	Yes
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM61	As received solid samples are extracted with hot water in a 20:1 ratio of water to soil ready for analysis by ICP.			AR	Yes
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.			AR	Yes
NONE	No Method Code	NONE	No Method Code			AR	Yes
NONE	No Method Code	PM17	Modified method EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.				

JE Job No: 18/6842

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
NONE	No Method Code	PM17	Modified method EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.			AR	
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.			AR	
TM15_A	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds, Vinyl Chloride & Styrene by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes

Appendix IV: All Trial Pit and Borehole Logs

BOREHOLE LOG

LOG NUMBER: BH18-01

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF
DRILLING CONTRACTOR: GII

DATE STARTED: 24/04/2018
DATE FINISHED: 24/04/2018
LOGGED BY: DB
DRILLING TYPE: S&A

EASTING: 313508
NORTHING: 261589
ELEVATION: 75.91mOD

Well Completion Description	Comments	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
	Borehole backfilled with drilling arisings		75.91	0		Ground Surface
						MADE GROUND Dark brown, firm to very firm, slightly gravelly CLAY - SILT/CLAY with angular to sub-angular clasts (no C&D noted)
			74.91			**MADE GROUND** Dark grey, firm to very firm, slightly gravelly CLAY - SILT/CLAY with angular to sub-angular clasts with some tile, glass and plastic fragments <1%
			72.91			**MADE GROUND** Dark grey, firm to very firm, slightly gravelly CLAY - SILT/CLAY with angular to sub-angular clasts with some red mortar, concrete blocks, insulated wire, and wood fragments <5%
	BH01-6.5m - Soil Sample			5		
			68.91			Total Depth of Borehole

REMARKS

Overall the made ground was largely clean boulder clay.
No PID readings were undertaken. The natural underlying subsoil in this area is reddish brown.

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SCALE

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BOREHOLE LOG

LOG NUMBER: BH18-02

HYDRO-ENVIRONMENTAL SERVICES

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF
DRILLING CONTRACTOR: GII

DATE STARTED: 24/04/2018
DATE FINISHED: 24/04/2018
LOGGED BY: DB
DRILLING TYPE: S&A

EASTING: 313520
NORTHING: 261636
ELEVATION: 75.93mOD

Well Completion Description	Comments	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
	Borehole backfilled with drilling arisings		75.93	0		Ground Surface
						MADE GROUND Grey, firm to very firm, slightly gravelly CLAY - SILT/CLAY with angular clasts and with some hardcore Fill (limestone/shale) <5%
			74.93			**MADE GROUND** Dark grey, firm to very firm, slightly gravelly CLAY - SILT/CLAY with angular clasts and with plastic, concrete and hardcore fill <1%. Refusal at 5mbgl. Possible boulder or concrete
	Soil sample - BH02-4.5m		70.93	5		E.O.H. 5.0mbgl Total Depth of Borehole

REMARKS

Overall the made ground was largely clean boulder clay. No PID readings were undertaken. The natural underlying subsoil in this area is reddish brown.

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SCALE

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BOREHOLE LOG

LOG NUMBER: BH18-03

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF
DRILLING CONTRACTOR: GII

DATE STARTED: 25/04/2018
DATE FINISHED: 25/04/2018
LOGGED BY: DB
DRILLING TYPE: S&A

EASTING: 313561
NORTHING: 261705
ELEVATION: 75.61mOD

Well Completion Description	Comments	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
	Borehole backfilled with drilling arisings		75.61	0		Ground Surface
						MADE GROUND Greyish brown, firm to very firm, slightly gravelly CLAY - SILT/CLAY with angular clasts. No C&D
			74.61			**MADE GROUND** Greyish brown, firm to very firm, slightly gravelly CLAY - SILT/CLAY with angular clasts and with hardcore fill, concrete, plastic and wood fragments (<1%) Some pockets with no C&D, just imported CLAY
	Soil Sample BH03-2.5-4.5m			5		
	Soil Sample BH03-8.2m		67.61			**NATURAL GROUND** Reddish brown, firm, slightly gravelly SILT/CLAY Refusal at 8.5mbgl on boulder/rock
			67.11			E.O.H. 8.5mbgl
			65.91	10		Total Depth of Borehole

REMARKS

Overall the made ground was largely clean boulder clay.
No PID readings were undertaken. The natural underlying subsoil in this area is reddish brown, therefore it appears the natural underly soil was intercepted during drilling

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SCALE

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BOREHOLE LOG

LOG NUMBER: BH18-04

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF
DRILLING CONTRACTOR: GII

DATE STARTED: 25/04/2018
DATE FINISHED: 25/04/2018
LOGGED BY: DB
DRILLING TYPE: S&A

EASTING: 313510
NORTHING: 261687
ELEVATION: 75.19mOD

Well Completion Description	Comments	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
	Borehole backfilled wih drill risings		75.19	0		Ground Surface
	Soil Sample BH04-0.5-1.0m		74.19			**MADE GROUND** Greyish brown, firm to very firm, slightly gravelly CLAY - SILT/CLAY with angular clasts. No C&D
						MADE GROUND Greyish brown, firm to very firm, slightly gravelly CLAY - SILT/CLAY with angular clasts and with hardcore fill, red mortar and concrete, plastic and tile fragments (<1%) Some pockets with no C&D, just imported CLAY
				5		
	Soil Sample BH04-8.5m		67.19			**NATURAL GROUND** Reddish brown, firm, slightly gravelly SILT/CLAY with some angular clast Refusal at 9.7mbgl
			65.49			E.O.H. 9.7mbgl
				10		

REMARKS

Overall the made ground was largely clean boulder clay.
No PID was undertaken. The natural underlying subsoil in this area is reddish brown, therefore it appears the natural underly soil was intercepted during drilling

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SCALE

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HYDRO-ENVIRONMENTAL SERVICES

BOREHOLE LOG

LOG NUMBER: BH18-05

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF
DRILLING CONTRACTOR: GII

DATE STARTED: 26/04/2018
DATE FINISHED: 26/04/2018
LOGGED BY: MGill
DRILLING TYPE: S&A

EASTING: 313629
NORTHING: 261665
ELEVATION: 73.58mOD

Well Completion Description	Comments	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
	Borehole backfilled with drilling arisings		73.58	0		Ground Surface
						MADE GROUND Clay fill removed to create level platform for drilling machine
	0.5m of brown clay (fill) removed to allow BH to be drilled.		73.08			**MADE GROUND** Black, loose, sandy, clayey gravel of concrete, and angular and rounded gravel and cobbles
	Soil Sample - BH05-0.5-3.5m			5		
			68.08			Light brown, sticky, natural SILT/CLAY
	Soil Sample - BH05-5.9m		67.68			Total Depth of Borehole

REMARKS

Overall the made ground was largely concrete and clean boulder clay. Concrte may have been placed here as its adjacent to the access road.
No PID readings were undertaken. The natural underlying subsoil in this area is light brown/reddish brown, therefore it appears the natural underly soil was intercepted during drilling.

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SCALE

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BOREHOLE LOG

LOG NUMBER: BH18-06

HYDRO-ENVIRONMENTAL SERVICES

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF
DRILLING CONTRACTOR:

DATE STARTED: 26/04/2018
DATE FINISHED: 26/04/2018
LOGGED BY: MGill
DRILLING TYPE:

EASTING: 313602
NORTHING: 261725
ELEVATION: 73.36m OD

Well Completion Description	Comments	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
	Borehole backfilled with drilling arisings		73.36	0		Ground Surface
						MADE GROUND Black and grey loose, sandy GRAVEL and CLAY, with concrete and angular gravels and concrete, and some broken brick fragments. <1% C&D. No visual or olfactory evidence of soil contamination.
	Soil Sample - BH06-3.5-4.5m		68.86			Total Depth of Borehole
				5		

REMARKS

Overall the made ground was largely clean boulder clay and broken concrete.
No PID readings were undertaken.
No no visual or olfactory evidence of contamination was noted.

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SCALE

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TRIAL PIT LOG

TRIAL PIT NUMBER: TP18-01

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF

DATE STARTED: 23/04/2018
LOGGED BY: MG
CONTRACTOR: Kiernan Bros.

EASTING: 313422
NORTHING: 261602
ELEVATION: 76.03mOD

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				76.03	0		Ground Surface
No topsoil - bare ground with poor grass growth							**MADE GROUND** Brown and black, firm to stiff, slightly gravelly CLAY with very occasional red brick fragments + minor plastic & fabric.
PID - Max 0, Avg 0					1		2.5mbgl - Large siltstone boulders in light brown sandy CLAY
PID - Max 0, Avg 0					2		2.8m - buried tree branches surrounded by looser sandier fill material
PID - Max 0, Avg 0					3		below 2.8m back into CLAY
				71.83	4		E.O.H. 4.2mbgl
					5		Total Depth of Trial Pit

REMARKS:

No olfatory or no visual signs of contamination
Dry, no water encountered

PIT LENGTH:
PIT BREADTH:
FINAL DEPTH:
EXCAVATOR:

LEGEND
∇ - Water strike
D - Disturbed sample
B - Bulk disturbed sample
C - Composite sample
W - Water sample
V - Vane test
T - No. of threads
R - Average length of ribbons
Dil - Dilatancy recorded
ND - No dilatancy recorded

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SCALE

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TRIAL PIT LOG

TRIAL PIT NUMBER: TP18-02

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF

DATE STARTED: 23/04/2018
LOGGED BY: MG
CONTRACTOR: Kiernan Bros.

EASTING: 313481
NORTHING: 261620
ELEVATION: 75.93mOD

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				75.93	0		Ground Surface
PID - Max 113, Avg 94					1		**MADE GROUND** Black/brown, mainly dark brown, slightly gravelly CLAY, with angular cobbles and boulders of limestone & siltstone Fragments of rope, blocks (part), small pieces of plastic and fragments of red brick, and broken concrete <2% C&D
PID - Max 180, Avg 162					2		
Soil Sample - TP18-02-2.0-3.75m PID - Max 203, Avg 144	2.0-3.75m	C			3		
				72.18	4		E.O.H. 3.75mbgl Total Depth of Trial Pit
					5		

REMARKS:

No olfatory or no visual signs of contamination
Dry, no water encountered

PIT LENGTH:
PIT BREADTH:
FINAL DEPTH:
EXCAVATOR:

LEGEND
∇ - Water strike
D - Disturbed sample
B - Bulk disturbed sample
C - Composite sample
W - Water sample
V - Vane test
T - No. of threads
R - Average length of ribbons
Dil - Dilatancy recorded
ND - No dilatancy recorded

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SCALE

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TRIAL PIT LOG

TRIAL PIT NUMBER: TP18-03

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF

DATE STARTED: 23/04/2018
LOGGED BY: MG
CONTRACTOR: Kiernan Bros.

EASTING: 313408
NORTHING: 261647
ELEVATION: 74.95mOD

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				74.95	0		Ground Surface
PID - Max 0, Avg 0				73.85	1		**MADE GROUND** Brown, slightly gravelly CLAY with occasional concrete and brick fragments
PID - Max 43, Avg 42				73.25	2		**MADE GROUND** Broken concrete and angular limestone cobbles in loose black sandy CLAY
PID - Max 0, Avg 0				70.75	3 4		**MADE GROUND** Black/grey and small brown CLAY with gravels and cobbles, angular cobbles with very occasional red brick and very small pieces of concrete
					5		E.O.H. 4.2mbgl Total Depth of Trial Pit

REMARKS:

No olfatory or no visual signs of contamination
Dry, no water encountered

PIT LENGTH:
PIT BREADTH:
FINAL DEPTH:
EXCAVATOR:

LEGEND
∇ - Water strike
D - Disturbed sample
B - Bulk disturbed sample
C - Composite sample
W - Water sample
V - Vane test
T - No. of threads
R - Average length of ribbons
Dil - Dilatancy recorded
ND - No dilatancy recorded

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SCALE

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TRIAL PIT LOG

TRIAL PIT NUMBER: TP18-04

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF

DATE STARTED: 23/04/2018
LOGGED BY: MG
CONTRACTOR: Kiernan Bros.

EASTING: 313394
NORTHING: 261739
ELEVATION: 73.02mOD

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				73.02	0		Ground Surface
Soil Sample - TP18-04-1.0-4.3m	1.0-4.3m	C			1 2 3 4		**MADE GROUND** Dark brown and black slightly gravelly CLAY with very occasional concrete pipe fragments, small pieces of plastic drainage pipe, tree cutting, angular cobbles of siltstone, one small piece of steel ree-bar • <0.5 C&D • >99.5% Clay, gravel and cobbles
				68.72	5		E.O.H. 4.3mbgl Total Depth of Trial Pit

REMARKS:

No olfatory or no visual signs of contamination
Dry, no water encountered

PIT LENGTH:
PIT BREADTH:
FINAL DEPTH:
EXCAVATOR:

LEGEND
∇ - Water strike
D - Disturbed sample
B - Bulk disturbed sample
C - Composite sample
W - Water sample
V - Vane test
T - No. of threads
R - Average length of ribbons
Dil - Dilatancy recorded
ND - No dilatancy recorded

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SCALE

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TRIAL PIT LOG

TRIAL PIT NUMBER: TP18-05

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF

DATE STARTED: 23/04/2018
LOGGED BY: MG
CONTRACTOR: Kiernan Bros.

EASTING: 313426
NORTHING: 261754
ELEVATION: 72.49mOD

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				72.49	0		Ground Surface
PID - Max (0), Avg (0)					1		**MADE GROUND** Dark brown and grey, slightly gravelly CLAY with occasional angular boulders & cobbles of limestone and siltstone, and small signs of C&D materials • 1 half 4"block - 0.5m • Fragments ofred brick at 3.6mbgl • <2% C&D
Soil Sample - TP18-05-1.0-3.6m PID - Max (0), Avg (0)	1.0-3.6m				2		
PID - Max (0), Avg (0)				68.89	3		
					4		E.O.H. 3.6mbgl Total Depth of Trial Pit
					5		

REMARKS:

No olfatory or no visual signs of contamination
Dry, no water encountered.

PIT LENGTH:
PIT BREADTH:
FINAL DEPTH:
EXCAVATOR:

LEGEND
∇ - Water strike
D - Disturbed sample
B - Bulk disturbed sample
C - Composite sample
W - Water sample
V - Vane test
T - No. of threads
R - Average length of ribbons
Dil - Dilatancy recorded
ND - No dilatancy recorded

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SCALE

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TRIAL PIT LOG

TRIAL PIT NUMBER: TP18-06

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF

DATE STARTED: 23/04/2018
LOGGED BY: MG
CONTRACTOR: Kiernan Bros.

EASTING: 313443
NORTHING: 261716
ELEVATION: 73.52mOD

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				73.52	0		Ground Surface
							MADE GROUND Dark brown, gravelly CLAY with cobbles and subrounded & subangular gravels
				72.57	1		**MADE GROUND** Grey/brown loose, sandy gravelly CLAY with fragments of red bricks, concrete, blocks (whole + half + fragments of blocks), fragments of timber, plastic pipe, one piece of tarmac
PID - Max (2), Avg (0)					2		
Soil Sample - TP18-06-1.2-3.0m	1.2-3.0m	C			3		
				70.12			E.O.H. 3.4mbgl Total Depth of Trial Pit
					4		
					5		

REMARKS:

No olfatory or no visual signs of contamination
Dry, no water encountered

PIT LENGTH:
PIT BREADTH:
FINAL DEPTH:
EXCAVATOR:

LEGEND
∇ - Water strike
D - Disturbed sample
B - Bulk disturbed sample
C - Composite sample
W - Water sample
V - Vane test
T - No. of threads
R - Average length of ribbons
Dil - Dilatancy recorded
ND - No dilatancy recorded

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SCALE

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TRIAL PIT LOG

TRIAL PIT NUMBER: TP18-07

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF

DATE STARTED: 23/04/2018
LOGGED BY: MG
CONTRACTOR: Kiernan Bros.

EASTING: 313467
NORTHING: 261648
ELEVATION: 75.25mOD

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				72.25	0		Ground Surface
PID - Max (0), Avg (0)							**MADE GROUND** Brown and dark brown damp, firm, gravelly CLAY with occasional angular cobbles and boulders • Small pieces of steel wire at 1.6mbgl and concrete fragments • Plastic tape and timber at 3.4mbgl • Red brick at 3.8mbgl • Gravelly CLAY with <1% C&D • Slightly damp with water entering pit from G/L
PID - Max (10), Avg (8)					1		
					2		
PID - Max (19), Avg (11)					3		
				68.40	4		E.O.H. 3.85mbgl Total Depth of Trial Pit
					5		

REMARKS:

No olfatory or no visual signs of contamination
Dry, no water encountered in pit, but entered pit from ground level during heavy rain

PIT LENGTH:
PIT BREADTH:
FINAL DEPTH:
EXCAVATOR:

LEGEND
∇ - Water strike
D - Disturbed sample
B - Bulk disturbed sample
C - Composite sample
W - Water sample
V - Vane test
T - No. of threads
R - Average length of ribbons
Dil - Dilatancy recorded
ND - No dilatancy recorded

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SCALE

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TRIAL PIT LOG

TRIAL PIT NUMBER: TP18-08

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF

DATE STARTED: 23/04/2018
LOGGED BY: MGill
CONTRACTOR: Kiernan Bros.

EASTING: 313572
NORTHING: 261653
ELEVATION: 74.98mOD

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				74.98	0		Ground Surface
PID - Max (0), Avg (0)					1		**MADE GROUND** Brown and dark brown damp, firm, gravelly CLAY with occasional angular cobbles and boulders, and very small amounts of concrete, and plastic fragments. No visual or olfactory signs of soil contamination.
PID - Max (0), Avg (0)					2		
PID - Max (0), Avg (0)				71.98	3		Total Depth of Trial Pit
					4		
					5		

REMARKS:
No olfatory or no visual signs of contamination
Dry, no water encountered in pit.

PIT LENGTH:
PIT BREADTH:
FINAL DEPTH:
EXCAVATOR:

LEGEND
∇ - Water strike
D - Disturbed sample
B - Bulk disturbed sample
C - Composite sample
W - Water sample
V - Vane test
T - No. of threads
R - Average length of ribbons
Dil - Dilatancy recorded
ND - No dilatancy recorded

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SCALE

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TRIAL PIT LOG

TRIAL PIT NUMBER: TP18-09

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF

DATE STARTED: 24/04/2018
LOGGED BY: DB
CONTRACTOR: Kiernan Bros.

EASTING: 313592
NORTHING: 261780
ELEVATION: 71.83mOD

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				71.83	0		Ground Surface
PID - Max (50.5), Avg (10.2)				71.33			**MADE GROUND** Light brown, firm, slightly gravell SILT/CLAY with 20-30% C&D • red brick • slate • concrete blocks • minor amount of tarmac • tiles
Soil Sample TP18-09/0.5-2.0m	0.5-2.0m	C			1		**MADE GROUND** Dark grey to black, firm, SILT/CLAY with 20-30% C&D • concrete slate • tarmac • tiles
Soil Sample TP18-09/2.0-3.0m	2.0-3.0m	C			2		
PID - Max (0), Avg (0)				68.83	3		E.O.H. 3mbgl Total Depth of Trial Pit
					4		
					5		

REMARKS:

No olfactory or no visual signs of contamination

PIT LENGTH:
PIT BREADTH:
FINAL DEPTH:
EXCAVATOR:

LEGEND
∇ - Water strike
D - Disturbed sample
B - Bulk disturbed sample
C - Composite sample
W - Water sample
V - Vane test
T - No. of threads
R - Average length of ribbons
Dil - Dilatancy recorded
ND - No dilatancy recorded

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SCALE

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TRIAL PIT LOG

TRIAL PIT NUMBER: TP18-10

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF

DATE STARTED: 23/04/2018
LOGGED BY: MG
CONTRACTOR: Kiernan bros.

EASTING: 313470
NORTHING: 261766
ELEVATION: 72.09mOD

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				72.09	0		Ground Surface
							MADE GROUND Black and brown boulder CLAY. Slightly gravelly CLAY with rounded and subrounder cobbles and boulders. No C&D • 0-2 brown • 2-4 grey brown
					1		
					2		
					3		
				68.04	4		Total Depth of Trial Pit
					5		

REMARKS:

Dry clean. Collapsing from LHS
Dry, no water encountered

PIT LENGTH:
PIT BREADTH:
FINAL DEPTH:
EXCAVATOR:

LEGEND
∇ - Water strike
D - Disturbed sample
B - Bulk disturbed sample
C - Composite sample
W - Water sample
V - Vane test
T - No. of threads
R - Average length of ribbons
Dil - Dilatancy recorded
ND - No dilatancy recorded

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SCALE

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TRIAL PIT LOG

TRIAL PIT NUMBER: TP18-11

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF

DATE STARTED: 24/04/2018
LOGGED BY: DB
CONTRACTOR: Kiernan Bros

EASTING: 313538
NORTHING: 261744
ELEVATION: 74.61mOD

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				74.61	0		Ground Surface
Soil Sample TP18-11/0.5-2.0m	0.5-2.0m	C			1		**MADE GROUND** Brown and dark brown damp, firm, gravelly CLAY with occasional angular cobbles and boulders. CLAY only - no C&D
				71.51	3		Total Depth of Trial Pit

REMARKS:
No olfactory or visual signs of contamination noted.

PIT LENGTH:
PIT BREADTH:
FINAL DEPTH:
EXCAVATOR:

LEGEND
∇ - Water strike
D - Disturbed sample
B - Bulk disturbed sample
C - Composite sample
W - Water sample
V - Vane test
T - No. of threads
R - Average length of ribbons
Dil - Dilatancy recorded
ND - No dilatancy recorded

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SCALE

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TRIAL PIT LOG

TRIAL PIT NUMBER: TP18-12

HYDRO-ENVIRONMENTAL SERVICES

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF

DATE STARTED: 24/04/2018
LOGGED BY: DB
CONTRACTOR: Kiernan Bros.

EASTING: 313653
NORTHING: 261813
ELEVATION: 71.62mOD

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				71.62	0		Ground Surface
PID - Max (0.001), Avg (0.001)				70.52	1		**MADE GROUND** Light brown/greyish, firm SILT/CLAY with some angular cobbles along with 10-15% C&D • concrete • tiles • red brick
PID - Max (0.001), Avg (0.001) Soil Sample TP18-12/2.5-3.5m	2.5-3.5m	C		69.12	2		**MADE GROUND** Grey, gravelly SILT/CLAY with abundant tarmac chipping (20-30%)
				68.12	3		**MADE GROUND** Dark brown, soft to firm CLAY with some organic content and 5-10% C&D • grass roots • metal wiring • brick • concrete
					4		Total Depth of Trial Pit
					5		

REMARKS:

General bad odour likely due to organic content. No evidence of VOC.

PIT LENGTH:
PIT BREADTH:
FINAL DEPTH:
EXCAVATOR:

LEGEND
∇ - Water strike
D - Disturbed sample
B - Bulk disturbed sample
C - Composite sample
W - Water sample
V - Vane test
T - No. of threads
R - Average length of ribbons
Dil - Dilatancy recorded
ND - No dilatancy recorded

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SCALE

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TRIAL PIT LOG

TRIAL PIT NUMBER: TP18-13

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF

DATE STARTED: 24/04/2018
LOGGED BY: DB
CONTRACTOR: Kiernan Bros.

EASTING: 313650
NORTHING: 261733
ELEVATION: 72.31 mOD

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
PID - Max (0), Avg (0) Soil Sample TP18-13/1.0-1.5m				72.31	0		Ground Surface
				71.76	1		**MADE GROUND** Light grey,firm gravelly SILT/CLAY with angular to sub-angular clasts • concrete (<10-15%) • metal wires • tree roots
				70.81	2		**MADE GROUND** Dark grey, firm, slightly gravelly CLAY with angular to sub-angular clast (Boulder Clay) with minor amount of tarmac
				69.61	3		**MADE GROUND** Brown, firm slightly gravelly SILT/CLAY with minor amount of C&D (<2%) • metal reo bard • concrete blacks
					4		Total Depth of Trial Pit
					5		

REMARKS:

No olfactory or no visual signs of contamination.

PIT LENGTH:
PIT BREADTH:
FINAL DEPTH:
EXCAVATOR:

LEGEND
∇ - Water strike
D - Disturbed sample
B - Bulk disturbed sample
C - Composite sample
W - Water sample
V - Vane test
T - No. of threads
R - Average length of ribbons
Dil - Dilatancy recorded
ND - No dilatancy recorded

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SCALE

HYDRO-ENVIRONMENTAL SERVICES 22 Lower Main Street Dungarvan Co. Waterford Tel: 058-44122 Fax: 058-44244 Email: info@hydroenvironmental.ie

TRIAL PIT LOG

TRIAL PIT NUMBER: TP18-14

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF

DATE STARTED: 24/04/2018
LOGGED BY: DB
CONTRACTOR: Kiernan Bros

EASTING: 313696
NORTHING: 261688
ELEVATION: 71.78.mOD

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				71.78	0		Ground Surface
							MADE GROUND Brown, firm, gravelly SILT/CLAY with some angular to sub-angular cobbl;es and very minor amounts of concrete (<1-2%)
				70.18	1		
Soil Sample TP18-14/1.8m PID - Max (0), Avg (0)	1.8m	C		69.88	2		**MADE GROUND** Dark grey, firm, slightly gravelly CLAY with angular to sub-angular clasts
							MADE GROUND Reddish brown, firm SILT/CLAY with minor amounts of tarmac <2%
				68.88	3		Total Depth of Trial Pit
					4		
					5		

REMARKS:

No olfactory or no visual signs of contamination

PIT LENGTH:
PIT BREADTH:
FINAL DEPTH:
EXCAVATOR:

LEGEND
∇ - Water strike
D - Disturbed sample
B - Bulk disturbed sample
C - Composite sample
W - Water sample
V - Vane test
T - No. of threads
R - Average length of ribbons
Dil - Dilatancy recorded
ND - No dilatancy recorded

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SCALE

HYDRO-ENVIRONMENTAL SERVICES 22 Lower Main Street Dungarvan Co. Waterford Tel: 058-44122 Fax: 058-44244 Email: info@hydroenvironmental.ie

TRIAL PIT LOG

TRIAL PIT NUMBER: TP18-15

HYDRO-ENVIRONMENTAL SERVICES

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF

DATE STARTED: 24/04/2018
LOGGED BY: DB
CONTRACTOR: Kiernan Bros.

EASTING: 313709
NORTHING: 261835
ELEVATION: 71.54mOD

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				71.54	0		Ground Surface
							MADE GROUND Dark grey, slightly gravelly CLAY with angular to sub-angular clast with concrete and plastic C&D (5-10%) • concrete blocks • minor plastic • minor roots/tree branches • timber
					1		
					2		
				68.34	3		Total Depth of Trial Pit
					4		
					5		

REMARKS:

No olfactory or no visual signs of contamination.

PIT LENGTH:
PIT BREADTH:
FINAL DEPTH:
EXCAVATOR:

LEGEND
∇ - Water strike
D - Disturbed sample
B - Bulk disturbed sample
C - Composite sample
W - Water sample
V - Vane test
T - No. of threads
R - Average length of ribbons
Dil - Dilatancy recorded
ND - No dilatancy recorded

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SCALE

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TRIAL PIT LOG

TRIAL PIT NUMBER: TP18-16

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF

DATE STARTED: 24/04/2018
LOGGED BY: DB
CONTRACTOR: Kiernan Bros.

EASTING: 313672
NORTHING: 261764
ELEVATION: 72.18mOD

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				72.18	0		Ground Surface
Soil Sample TP18-16/2.0-3.0m PID - Max (0), Avg (0)	2.0-3.0m	C		69.18	1 2 3		**MADE GROUND** Dark grey, slightly gravelly CLAY with angular to sub-angular clast with regular C&D (5-10%) • concrete blocks • minor plastic • minor roots/tree branches • timber Total Depth of Trial Pit
					4 5		

REMARKS:

No olfactory or no visual signs of contamination.

PIT LENGTH:
PIT BREADTH:
FINAL DEPTH:
EXCAVATOR:

LEGEND
∇ - Water strike
D - Disturbed sample
B - Bulk disturbed sample
C - Composite sample
W - Water sample
V - Vane test
T - No. of threads
R - Average length of ribbons
Dil - Dilatancy recorded
ND - No dilatancy recorded

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SCALE

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TRIAL PIT LOG TP18-17

TRIAL PIT NUMBER: TP18-17

HYDRO-ENVIRONMENTAL SERVICES

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF

DATE STARTED: 24/04/2018
LOGGED BY: DB
CONTRACTOR: Kiernan Bros.

EASTING: 313713
NORTHING: 261736
ELEVATION: 71.29mOD

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				71.29	0		Ground Surface
PID - Max (0), Avg (0)							**MADE GROUND** Dark grey and dark brown layer firm, slightly gravelly SILT/CLAY with regular pieces of conrete blocks (20-30%)
Soil Sample TP18-17/0.5-2.0m	0.5-2.0m	C			1		
PID - Max (0), Avg (0)				69.29	2		**MADE GROUND** Mainly concrete block rubble (60-70%) woth mminor amounts SILT/CLAY • minor amounts of plastic and material wires
				68.09	3		Total Depth of Trial Pit
					4		
					5		

REMARKS:

No olfactory or no visual signs of contamination.

PIT LENGTH:
PIT BREADTH:
FINAL DEPTH:
EXCAVATOR:

LEGEND
∇ - Water strike
D - Disturbed sample
B - Bulk disturbed sample
C - Composite sample
W - Water sample
V - Vane test
T - No. of threads
R - Average length of ribbons
Dil - Dilatancy recorded
ND - No dilatancy recorded

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TRIAL PIT LOG

TRIAL PIT NUMBER: TP18-18

PROJECT NUMBER: P1317-2
SITE: Clashford, Co. Meath
CLIENT: Clashford WRF

DATE STARTED: 24/04/2018
LOGGED BY: MG
CONTRACTOR: Kiernan Bros.

EASTING: 313434
NORTHING: 261523
ELEVATION: 77.36mOD

Comments	Sample Number	Sample Type	Water Strikes	Elevation	Meters Below Ground Surface	Lithology	Formation Description
				77.36	0		Ground Surface
				77.16			**MADE GROUND** Topsoil layer, with vegetation comprising soft, brown sandy CLAY
					1		**MADE GROUND** Dark brown, firm to stiff, dry, slightly gravelly CLAY with angular and rounded cobbles of limestone and siltstone. Dark grey and dark brown layer Fill. Layer 0.1-0.15m with rubble 20-30% Mainly CLAY Fill with minor amounts of plastic and fragments of red bricks, and wire
Soil sample TP18-18-1.5-4.0m	1.5-4.0m	C			2		
					3		
				73.26	4		Total Depth of Trial Pit
					5		

REMARKS:

No odouror visual signs of contamination noted .

PIT LENGTH:
PIT BREADTH:
FINAL DEPTH:
EXCAVATOR:

LEGEND
∇ - Water strike
D - Disturbed sample
B - Bulk disturbed sample
C - Composite sample
W - Water sample
V - Vane test
T - No. of threads
R - Average length of ribbons
Dil - Dilatancy recorded
ND - No dilatancy recorded

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SCALE

HYDRO-ENVIRONMENTAL SERVICES 22 Lower Main Street Dungarvan Co. Waterford Tel: 058-44122 Fax: 058-44244 Email: info@hydroenvironmental.ie

Robert Meehan
Consultant Geologist

TRIAL PIT RECORD TP1

Project: Waste Licence Application at Naul

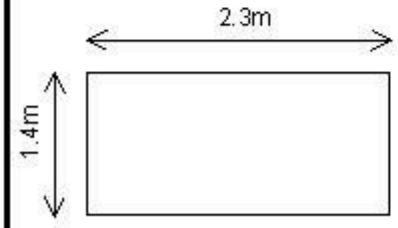
Site: Naul
Client: John Sheils Planning/Env. Ltd.
Project No.: 16/046

All dimensions on this sheet are in metres unless otherwise stated

Method and Equipment: JCB 3X Backhoe Excavator
Logged by: R. Meehan Date: 06/01/2009
Easting: 313158 Northing: 251561
Ground level OD: 75.5m

Samples & in-situ tests			Result Peak (Residual)	Water	Strata details			
Depth taken	Type	No			O.D. Level	Legend	Depth	Description
0.2-0.3					75.2			TOPSOIL 'A' horizon: soft to firm, crumb to subangular blocky, dark greyish brown (4/2, 10YR) silty clay loam with occasional grass rootlets. TOPSOIL/SUBSOIL 'B' horizon: firm to stiff, massive, dark yellowish brown (4/4, 10 YR) CLAY with occasional gravel and occasional rootlets.
0.5 0.47-0.52					75.0			'C' horizon (SUBSOIL): firm to stiff, massive (yet fissile owing to layering from 'lifts'), dark greyish brown (4/2, 10YR) SILT/CLAY with common gravels and occasional cobbles and boulders. Subsoil is unmottled.
1.0								Some brown (4/3, 10YR) pods up to 0.4m across.
1.5								Occasional fragments of plastic and steel, but rare overall.
2.0								
2.22					73.3			**Trial pit completed at 2.22m on dark greyish brown, massive, stiff boulder clay 'fill'.**
2.5								
3.0								
3.5								
4.0								
4.5								
5.0								

Plan



Bearing : 84° (W-E)

Stability :

Trial pit walls very consolidated, and material very competent.

General remarks :

Dug in western portion of the site, into a dry, grass-covered 'reclaimed' field. Dug on a 2° slope, falling northwestwards.

Groundwater :

Dry.

Sequence summary:

Well drained, deep, 'filled' topsoil over filled boulder clay, 'lifted' on-site.

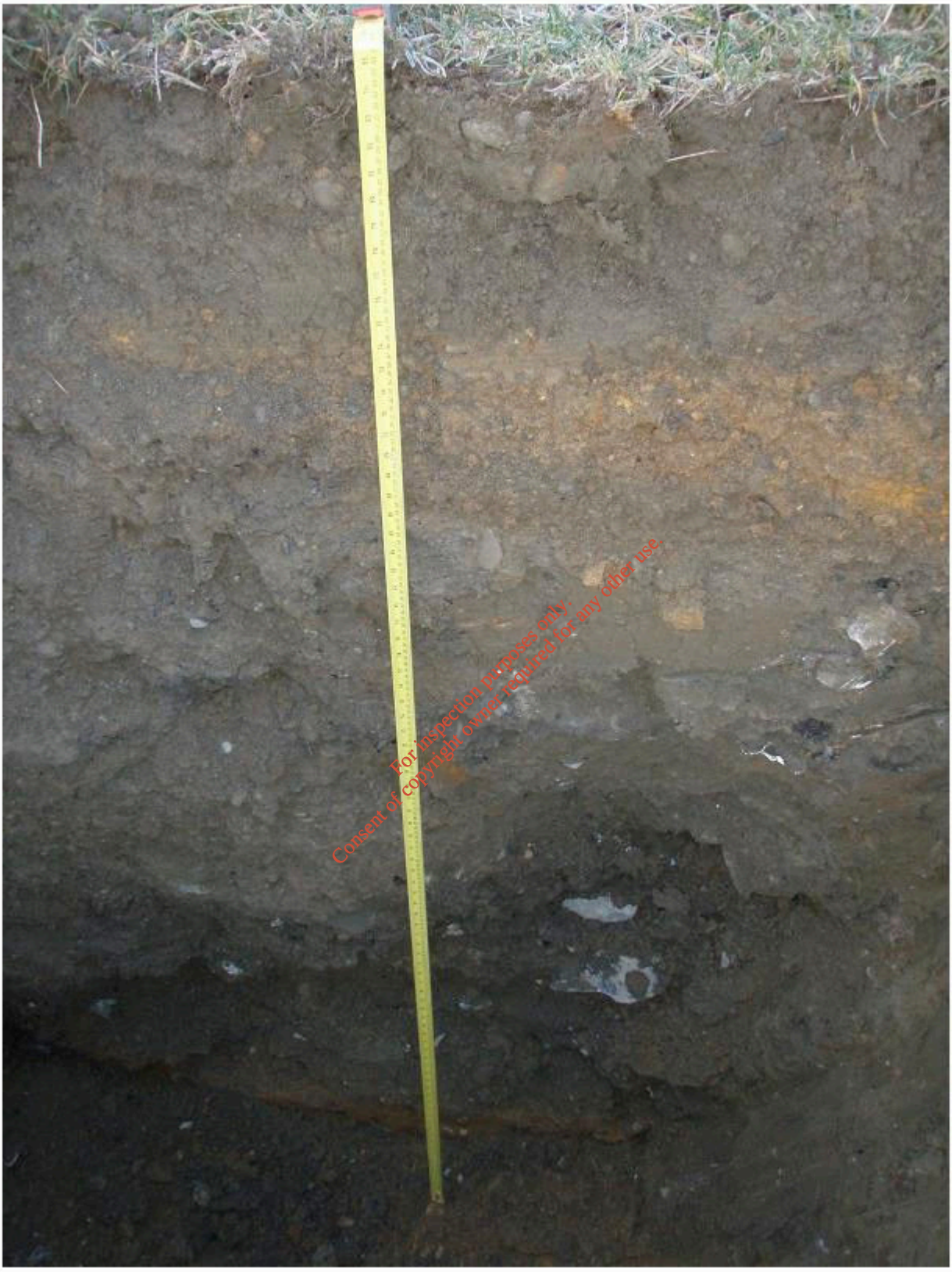


Plate A1: Profile of deep topsoil overlying subsoil in trial hole no. 1. See the absence of waste material from the profile and the well aerated nature of the material, with no groundwater seepages throughout the profile.

Robert Meehan
Consultant Geologist

TRIAL PIT RECORD TP2

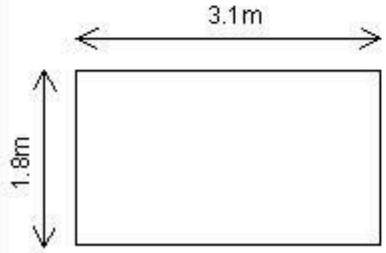
Project: Waste Licence Application at Naul

Site: Naul
Client: John Sheils Planning/Env. Ltd.
Project No.: 16/046

Method and Equipment: JCB 3X Backhoe Excavator
Logged by: R. Meehan Date: 06/01/2009
Easting: 313256 Northing: 261562
All dimensions on this sheet are in metres unless otherwise stated. Ground level OD: 75.5m

Samples & in-situ tests			Result Peak (Residual)	Water	Strata details			
Depth taken	Type	No			O.D. Level	Legend	Depth	Description
0.14-0.16					75.35			TOPSOIL 'A' horizon: compact, crumb, dark brown (3/3, 10YR) loam with abundant grass roots and rootlets. TOPSOIL/SUBSOIL 'B' horizon: soft to firm, subangular blocky to massive, dark yellowish brown (3/4, 10YR) SILT/CLAY with occasional gravels and occasional rootlets.
0.5								
0.58-0.6					74.9			'C' horizon (SUBSOIL): firm to very stiff, massive (yet very fissile owing to layering from 'lifts'), very dark greyish brown (3/2, 10YR) SILT/CLAY with abundant gravels and occasional cobbles and boulders. Subsoil is unmottled.
1.0								
1.5								Occasional fragments of plastic ties and brick clasts, but rare overall.
2.0								
2.12					73.4			**Trial pit completed at 2.12m on very dark greyish brown, massive, very stiff boulder clay 'fill'.**
2.5								
3.0								
3.5								
4.0								
4.5								
5.0								

Plan



Bearing : 92° (W-E)

Stability :

Trial pit walls very consolidated, and material very competent.

General remarks :

Dug in central portion of the northwestern, grass-covered 'reclaimed' field. Dug on a 2° slope, falling northwards.

Groundwater :

Dry initially, but small seepage at 1.05m depth.

Sequence summary:

Well drained, deep, 'filled' topsoil over filled boulder clay, 'lifted' on-site.

Plate A2: Profile of topsoil overlying subsoil in trial hole no. 2. See the general absence of waste material from the profile and the well aerated nature of the material, with one slight groundwater seepage at 1.05m depth.

Robert Meehan
Consultant Geologist

TRIAL PIT RECORD TP3

Project: Waste Licence Application at Naul

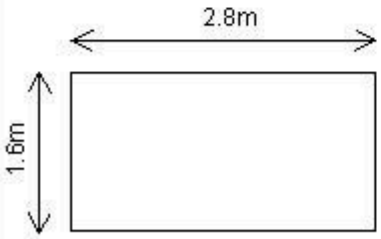
Site: Naul
Client: John Sheils Planning/Env. Ltd.
Project No.: 16/046

Method and Equipment: JCB 3X Backhoe Excavator
Logged by: R. Meehan Date: 06/01/2009
Easting: 313348 Northing: 261554
Ground level OD: 76.5m

All dimensions on this sheet are in metres unless otherwise stated

Samples & in-situ tests			Result Peak (Residual)	Water	Strata details			
Depth taken	Type	No			O.D. Level	Legend	Depth	Description
0.15-0.16					76.35			'A' horizon (TOPSOIL): compact to soft, crumb to subangular blocky, very dark greyish brown (3/2, 10YR) silty clay loam with common grass roots and rootlets.
0.5								
1.0								'B/C' horizon (SUBSOIL): firm to stiff, massive (yet fissile owing to layering from 'lifts'), very dark greyish brown (3/2, 10YR) SILT/CLAY with abundant gravels, cobbles and boulders. Subsoil is unmottled.
1.5								Occasional pieces of concrete and occasional plastic ties.
2.0								
2.5					74.0			**Trial pit completed at 2.5m on very dark greyish brown, massive stiff boulder clay 'fill'.**
3.0								
3.5								
4.0								
4.5								
5.0								

Plan



Bearing : 84° (W-E)

Stability :

Trial pit walls very consolidated, and material very competent.

General remarks :

Dug in eastern portion of the northwestern dry, grass-covered, 'reclaimed' field. Dug on a 3° slope, falling north-northeastwards.

Groundwater :

Dry.

Sequence summary:

Well drained, shallow, 'filled' topsoil over filled boulder clay, 'lifted' on-site.

Plate A3: Profile of shallow soil overlying subsoil in trial hole no. 3. See the occasional pieces of concrete in the basal area of the profile and the well aerated nature of the material, with no groundwater seepages recorded to 2.5m depth.

Robert Meehan
Consultant Geologist

TRIAL PIT RECORD TP4

Project: Waste Licence Application at Naul

Site: Naul
Client: John Sheils Planning/Env. Ltd.
Project No.: 16/046

Method and Equipment: JCB 3X Backhoe Excavator

Logged by: R. Meehan Date: 06/01/2009

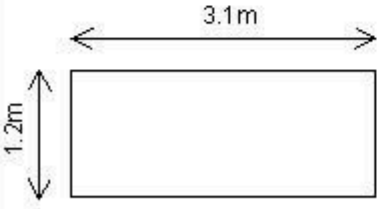
Easting: 313312 Northing: 261724

All dimensions on this sheet are in metres unless otherwise stated

Ground level OD: 69.5m

Samples & in-situ tests			Result Peak (Residual)	Water	Strata details			
Depth taken	Type	No			O.D. Level	Legend	Depth	Description
0.1-0.13					69.4			TOPSOIL 'A' horizon: soft, crumb to subangular blocky, dark brown (3/3, 10YR) silty clay loam with common grass roots and rootlets.
0.45-0.47								TOPSOIL/SUBSOIL 'B' horizon: very soft to firm, massive, very dark greyish brown (3/2, 10YR) CLAY with occasional gravel and occasional rootlets.
0.5					69.0			
1.0								'C' horizon (SUBSOIL): firm to stiff, massive (yet very fissile owing to layering from 'lifts'), very dark greyish brown (3/2, 10YR) slightly sandy SILT/CLAY with common gravels, cobbles and boulders. Subsoil is unmottled.
1.5								Some pods of SILT and fine SAND up to 0.2m across.
2.0								Occasional fragments of plastic, wood and steel, but rare overall.
2.5					67.0			**Trial pit completed at 2.5m on very dark greyish brown, massive, stiff boulder clay 'fill'.**
3.0								
3.5								
4.0								
4.5								
5.0								

Plan



Bearing : 4° (N-S)

Stability :

Trial pit walls very consolidated, and material very competent.

General remarks :

Dug in northeastern portion of the dry, grass-covered 'reclaimed' field. Dug on a 3° slope, falling north-northeastwards, in a low area.

Groundwater :

Dry.

Sequence summary:

Well drained, deep, 'filled' topsoil over filled boulder clay, 'lifted' on-site.

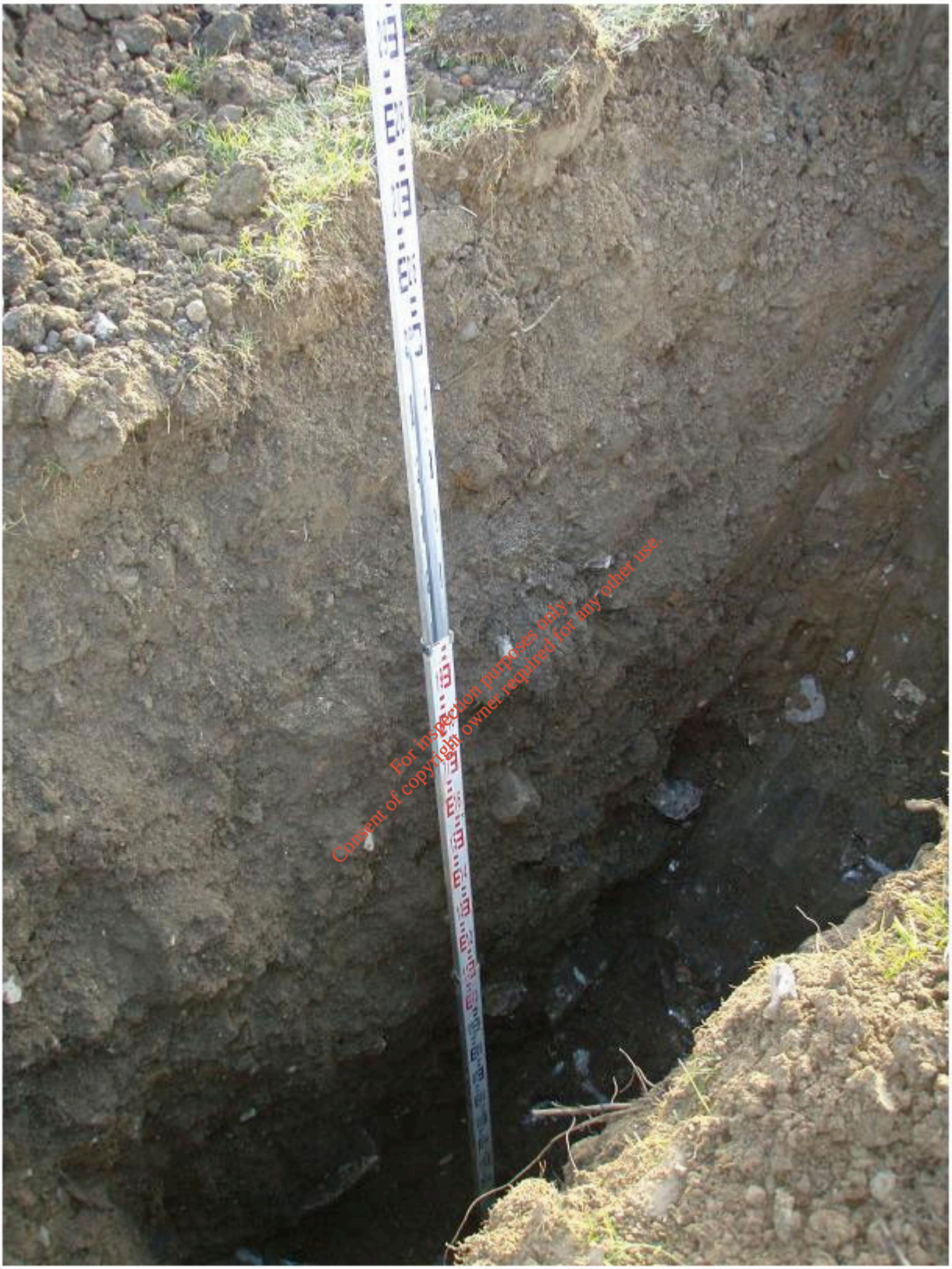


Plate A4: Profile of deep topsoil overlying subsoil in trial hole no. 4. See the concrete piece in the basal area of the profile and the well aerated nature of the material, with no groundwater seepages recorded to 2.5m depth.

Robert Meehan
Consultant Geologist

TRIAL PIT RECORD TP5

Project: Waste Licence Application at Naul

Site: Naul
Client: John Sheils Planning/Env. Ltd.
Project No.: 16/046

All dimensions on this sheet are in metres unless otherwise stated

Method and Equipment: JCB 3X Backhoe Excavator

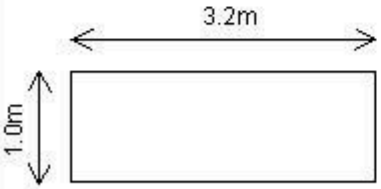
Logged by: R. Meehan Date: 06/01/2009

Easting: 313254 Northing: 261476

Ground level OD: 79.0m

Samples & in-situ tests			Result Peak (Residual)	Water	Strata details			
Depth taken	Type	No			O.D. Level	Legend	Depth	Description
0.12-0.14					78.9			TOPSOIL/'A' horizon: compact to very soft, crumb to massive, dark yellowish brown (3/4, 10YR) silty clay loam with abundant grass roots and rootlets. TOPSOIL/SUBSOIL 'B' horizon: firm to stiff, massive, dark brown (3/3, 10YR) silty clay loam.
0.3-0.34 0.5					78.7			
1.0								'C' horizon (SUBSOIL): firm to stiff, massive (yet fissile owing to layering from 'lifts'), very dark greyish brown (3/2, 10YR) SILT/CLAY with abundant gravels and occasional cobbles and boulders. Subsoil is unmottled.
1.5								
2.0								Occasional pieces and blocks of concrete and fragments of plastic, wood and steel.
2.47 2.5					76.5			**Trial pit completed at 2.47m on very dark greyish brown, massive, stiff boulder clay 'fill'.**
3.0								
3.5								
4.0								
4.5								
5.0								

Plan



Bearing : 30° (SW-NE)

Stability :

Trial pit walls very consolidated, and material very competent.

General remarks :

Dug in southwestern portion of the dry, grass-covered 'reclaimed' field. Dug on a 1° slope, falling northwards.

Groundwater :

Dry.

Sequence summary:

Well drained, shallow, 'filled' topsoil over filled boulder clay, 'lifted' on-site.

Plate A5: Profile of shallow topsoil overlying subsoil in trial hole no. 5. See the occasional concrete pieces and fragments of steel within the profile and the well aerated nature of the material, with no groundwater seepages recorded to 2.47m depth.

Robert Meehan
Consultant Geologist

TRIAL PIT RECORD TP6

Project: Waste Licence Application at Naul

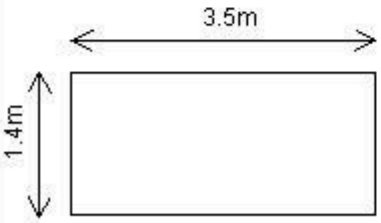
Site: Naul
Client: John Sheils Planning/Env. Ltd.
Project No.: 16/046

Method and Equipment: JCB 3X Backhoe Excavator
Logged by: R. Meehan Date: 06/01/2009
Easting: 313379 Northing: 261695
Ground level OD: 66.5m

All dimensions on this sheet are in metres unless otherwise stated

Samples & in-situ tests			Result Peak (Residual)	Water	Strata details			
Depth taken	Type	No			O.D. Level	Legend	Depth	Description
0.25-0.29					66.2			TOPSOIL 'A' horizon: firm to stiff, massive, dark brown (3/3, 10YR) silty clay loam with occasional grass rootlets.
0.5								'B/C' horizon (SUBSOIL): very soft to firm, massive (yet slightly fissile in patches, owing to layering from 'lifts'), very dark greyish brown (3/2, 10YR) slightly sandy SILT/CLAY with abundant gravels and occasional cobbles.
1.0								Subsoil is unmottled, with occasional shell fragments within.
1.5								No waste material.
2.0								
2.5								
2.8					63.7			**Trial pit completed at 2.8m on very dark greyish brown, massive, stiff boulder clay.**
3.0								
3.5								
4.0								
4.5								
5.0								

Plan



Bearing : 152° (NW-SE)

Stability :

Trial pit walls very consolidated, and material very competent.

General remarks :

Dug in northwestern portion of the low, 'failed' forestry area. Dug on a 1° slope, falling northwards.

Groundwater :

Dry.

Sequence summary:

Well drained, shallow, imported topsoil over *in situ* boulder clay.

Plate A6: Profile of shallow topsoil overlying subsoil in trial hole no. 6. Surprisingly, given the low elevation, this hole was dry. See the complete absence of waste material in the clean *in situ* subsoil, with no groundwater seepages recorded to 2.8m depth.

Robert Meehan
Consultant Geologist

TRIAL PIT RECORD TP7

Project: Waste Licence Application at Naul

Site: Naul
Client: John Sheils Planning/Env. Ltd.
Project No.: 16/046

Method and Equipment: JCB 3X Backhoe Excavator

Logged by: R. Meehan Date: 06/01/2009

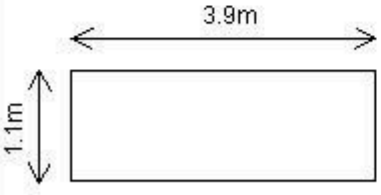
Easting: 313433 Northing: 261574

All dimensions on this sheet are in metres unless otherwise stated

Ground level OD: 70.5m

Samples & in-situ tests			Result Peak (Residual)	Water	Strata details			
Depth taken	Type	No			O.D. Level	Legend	Depth	Description
0.12-0.15					70.35			'TOPSOIL/A' horizon: very soft to firm, crumb/pocket/blocky/generally massive, very dark greyish brown (3/2, 10YR) clay loam with common grass roots and rootlets.
0.5								'B/C' horizon (SUBSOIL): very soft to firm, massive (but fissile below 1.5m depth owing to layering from 'lifts'), very dark greyish brown (3/2, 10YR) SILT/CLAY with common gravels and occasional cobbles and boulders. Subsoil is unmottled.
1.0								
1.5								Some sandy SILT/CLAY pods up to 0.5m across.
2.0								
2.3					68.2			**Trial pit completed at 2.3m on very dark greyish brown, massive, stiff boulder clay 'fill'.**
2.5								
3.0								
3.5								
4.0								
4.5								
5.0								

Plan



Bearing : 152° (NW-SE)

Stability :

Trial pit walls very consolidated, and material very competent.

General remarks :

Dug in southwestern portion of the low, 'failed' forestry area. Dug on a 1° slope, falling northwards.

Groundwater :

Water table rests at 2.04m bgl.

Sequence summary:

Well drained, shallow, 'filled' topsoil over filled boulder clay, 'lifted' on-site.

Plate A7: Profile of shallow topsoil overlying subsoil in trial hole no. 7. The water table seeps into this hole and rests at 2.04m depth below surface. See the complete absence of waste material and the preponderance of 'clean' imported subsoil here.

Robert Meehan
Consultant Geologist

TRIAL PIT RECORD TP8

Project: Waste Licence Application at Naul

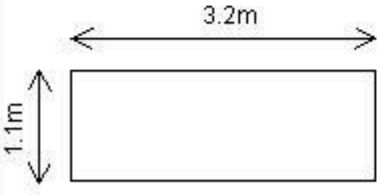
Site: Naul
Client: John Sheils Planning/Env. Ltd.
Project No.: 16/046

Method and Equipment: JCB 3X Backhoe Excavator
Logged by: R. Meehan — Date: 06/01/2009
Easting: 313488 — Northing: 261725
Ground level OD: 65.0m

All dimensions on this sheet are in metres unless otherwise stated

Samples & in-situ tests			Result Peak (Residual)	Water	Strata details			
Depth taken	Type	No			O.D. Level	Legend	Depth	Description
0.31-0.42					64.65			TOPSOIL 'A' horizon: very soft, crumb to subangular blocky, very dark greyish brown (3/2, 10YR) sandy clay loam with abundant grass roots and rootlets.
0.5								'C$_1$' horizon (SUBSOIL 1): very soft, massive (yet slightly fissile owing to layering from 'lifts'), very dark greyish brown (3/2, 10YR) and dark yellowish brown (3/4, 10YR) but **unmottled** SILT/CLAY with abundant gravels (filled material).
1.0								
1.2-1.3					63.75			'C$_2$' horizon (SUBSOIL 2): stiff to very stiff, massive (yet fissile owing to layering from 'lifts'), very dark greyish brown (3/2, 10YR) gravelly slightly sandy SILT/CLAY with some shell fragments (*in situ* material).
1.5								
2.0								
2.2					62.8			**Trial pit completed at 2.2m on very dark greyish brown, massive, very stiff, *in situ* boulder clay.**
2.5								
3.0								
3.5								
4.0								
4.5								
5.0								

Plan



Bearing : 52° (SW-NE)

Stability :

Trial pit walls very consolidated, and material very competent.

General remarks :

Dug in northern portion of the low, 'failed' forestry area. Dug on a 1° slope, falling northwards.

Groundwater :

Dry initially, but some seeps below 1m depth.

Sequence summary:

Well drained, deep, 'filled' topsoil and subsoil over *in situ* boulder clay.

Plate A8: Profile of deep topsoil overlying 2 no. subsoil units in trial hole no. 8. Though initially dry, some groundwater seeps into this hole at depths below 1.0m below surface. See again the complete absence of waste material in the imported, uppermost subsoil units, and the *in situ* subsoil underneath.

Robert Meehan
Consultant Geologist

TRIAL PIT RECORD TP9

Project: Waste Licence Application at Naul

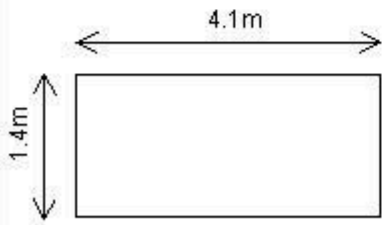
Site: Naul
Client: John Sheils Planning/Env. Ltd.
Project No.: 16/046

All dimensions on this sheet are in metres unless otherwise stated

Method and Equipment: JCB 3X Backhoe Excavator
Logged by: R. Meehan Date: 06/01/2009
Easting: 313712 Northing: 261819
Ground level OD: 64.0m

Samples & in-situ tests			Result Peak (Residual)	Water	Strata details			
Depth taken	Type	No			O.D. Level	Legend	Depth	Description
0.3-0.4 0.5					63.6			TOPSOIL 'A' horizon: compact to very soft, crumb to massive, very dark greyish brown (3/2, 10YR) CLAY with abundant grass roots and rootlets.
1.0								'C' horizon (SUBSOIL): very stiff to hard, massive, dark greyish brown (4/2, 10YR) gravelly SILT/CLAY, with occasional shell fragments.
1.5								Subsoil is unmottled.
2.0								Some pods of gravelly CLAY up to 0.6m across.
2.2					61.8			**Trial pit completed at 2.2m on dark greyish brown, massive, hard, *in situ* boulder clay.**
2.5								
3.0								
3.5								
4.0								
4.5								
5.0								

Plan



Bearing : 90° (W-E)

Stability :

Trial pit walls very consolidated, and material extremely competent.

General remarks :

Dug in northeastern portion of the of the low, forestry area. Dug on a 2° slope, falling northwards.
Topsoil is very stiff CLAY and is of very poor quality.

Groundwater :

Dry.

Sequence summary:

Well drained, shallow to deep, 'filled' CLAY 'topsoil' over *in situ* boulder clay.

Plate A9: Profile of relatively shallow topsoil overlying overconsolidated, very stiff to hard subsoil in trial hole no. 9. See again the complete absence of waste material in the clean *in situ* subsoil here also. The topsoil is of very poor quality and may actually comprise mostly CLAY subsoil. The hole was dry to 2.2m depth.

Robert Meehan
Consultant Geologist

TRIAL PIT RECORD TP10

Project: Waste Licence Application at Naul

Site: Naul
Client: John Sheils Planning/Env. Ltd.
Project No.: 16/046

Method and Equipment: JCB 3X Backhoe Excavator

Logged by: R. Meehan — Date: 06/01/2009

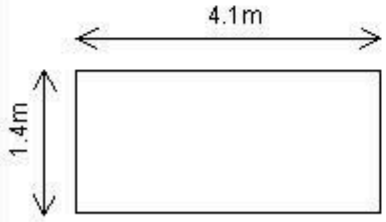
Easting: 313711 — Northing: 261705

All dimensions on this sheet are in metres unless otherwise stated

Ground level OD: 68.5m

Samples & in-situ tests			Result Peak (Residual)	Water	Strata details			
Depth taken	Type	No			O.D. Level	Legend	Depth	Description
0.18-0.2					68.3			TOPSOIL/'A' horizon: compact, crumb, dark brown (3/3, 10YR) silty clay loam with abundant grass roots and rootlets. TOPSOIL/SUBSOIL 'B' horizon: firm to stiff, massive, very dark greyish brown (3/2, 10YR) gravelly SILT/CLAY with occasional rootlets.
0.32-0.4					68.1			'C' horizon (SUBSOIL): very stiff to hard, massive (yet slightly fissile owing to layering from 'lifts'), dark yellowish brown (3/4, 10YR) gravelly sandy SILT/CLAY with common gravels, cobbles and boulders.
0.5								Subsoil is unmottled.
1.0								Some gravelly SILT pods up to 0.4m across.
1.5								
2.0								
2.25					66.25			**Trial pit completed at 2.25m on dark yellowish brown, massive, hard, *in situ* boulder clay'.**
2.5								
3.0								
3.5								
4.0								
4.5								
5.0								

Plan



Bearing : 16° (N-S)

Stability :

Trial pit walls very consolidated, and material very competent.

General remarks :

Dug in southeastern portion of the forestry area. Dug in a flat locality, where trees are growing.

Groundwater :

Dry.

Sequence summary:

Well drained, deep, 'filled' topsoil over *in situ* boulder clay.

Plate A10: Profile of relatively shallow topsoil overlying overconsolidated, very stiff to hard subsoil in trial hole no. 10. See again the complete absence of waste material in this *in situ* subsoil material. The topsoil is of slightly better quality here and the subsoil is slightly more aerated. The hole was dry to 2.25m depth.

Robert Meehan
Consultant Geologist

TRIAL PIT RECORD TP11

Project: Waste Licence Application at Naul

Site: Naul
Client: John Sheils Planning/Env. Ltd.
Project No.: 16/046

Method and Equipment: JCB 3X Backhoe Excavator

Logged by: R. Meehan — Date: 06/01/2009

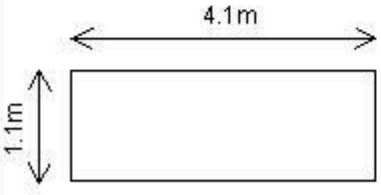
Easting: 313449 — Northing: 261259

All dimensions on this sheet are in metres unless otherwise stated

Ground level OD: 75.0m

Samples & in-situ tests			Result Peak (Residual)	Water	Strata details			
Depth taken	Type	No			O.D. Level	Legend	Depth	Description
0.5								No topsoil layer. Uppermost 0.2m is slightly more open with some frost cracks.
1.0								'C' horizon (SUBSOIL): very soft to stiff (alternating, layer to layer), massive (yet fissile owing to layering from 'lifts'), very dark brown (3/3, 10YR) sandy SILT/CLAY with abundant gravels, cobbles and boulders.
1.5								Subsoil is unmottled.
2.0								Occasional pieces of concrete, with some wood and branches also.
2.4 2.5					72.6			**Trial pit completed at 2.4m on very dark brown, massive, stiff boulder clay 'fill'.**
3.0								
3.5								
4.0								
4.5								
5.0								

Plan



Bearing : 24° (SW-NE)

Stability :

Trial pit walls very consolidated, and material very competent.

General remarks :

Dug in southern portion of recently-filled eastern portion of the site, into an area of bare ground. Dug on a flat, low ridge summit.

Groundwater :

Dry.

Sequence summary:

Deep, 'filled' boulder clay, 'lifted' on-site. No topsoil.

Plate A11: Profile of overconsolidated subsoil with alternating layers of very soft to stiff material in trial hole no. 11. Here some buried pieces of concrete are seen at depth. No topsoil has been emplaced above this material as of yet, and the ground is bare.

Robert Meehan
Consultant Geologist

TRIAL PIT RECORD TP12

Project: Waste Licence Application at Naul

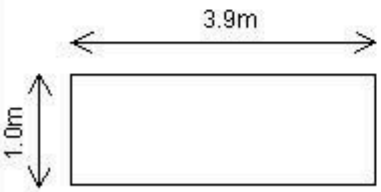
Site: Naul
Client: John Sheils Planning/Env. Ltd.
Project No.: 16/046

All dimensions on this sheet are in metres unless otherwise stated

Method and Equipment: JCB 3X Backhoe Excavator
Logged by: R. Meehan Date: 06/01/2009
Easting: 313451 Northing: 261402
Ground level OD: 75.5m

Samples & in-situ tests			Result Peak (Residual)	Water	Strata details			
Depth taken	Type	No			O.D. Level	Legend	Depth	Description
0.5								No topsoil layer. Uppermost 0.2m is slightly more open but very clayey, with some frost cracks.
1.0								'C' horizon (SUBSOIL): very soft to stiff (alternating, layer to layer), massive (yet fissile owing to layering from 'lifts'), very dark brown (3/3, 10YR) sandy SILT/CLAY with abundant gravels, cobbles and boulders.
1.5								Subsoil is unmottled.
2.0								Occasional pieces of concrete, with some wood and branches also.
2.35					73.15			**Trial pit completed at 2.35m on very dark brown, massive, stiff boulder clay 'fill'.**
2.5								
3.0								
3.5								
4.0								
4.5								
5.0								

Plan



Bearing : 66° (NW-SE)

Stability :

Trial pit walls very consolidated, and material very competent.

General remarks :

Dug in central portion of recently-filled eastern portion of the site, into an area of bare ground. Dug on a flat, low ridge summit.

Groundwater :

Dry.

Sequence summary:

Deep, 'filled' boulder clay, 'lifted' on-site. No topsoil.

Plate A12: Profile of overconsolidated subsoil with alternating layers of very soft to stiff material in trial hole no. 12. Here also some buried pieces of concrete are seen at depth. No topsoil has been emplaced above this material as of yet, and the ground is bare.

Robert Meehan
Consultant Geologist

TRIAL PIT RECORD TP13

Project: Waste Licence Application at Naul

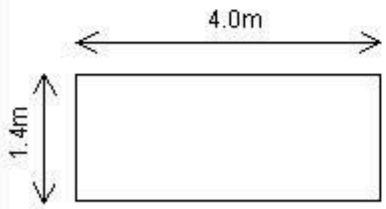
Site: Naul
Client: John Sheils Planning/Env. Ltd.
Project No.: 16/046

All dimensions on this sheet are in metres unless otherwise stated

Method and Equipment: JCB 3X Backhoe Excavator
Logged by: R. Meehan Date: 06/01/2009
Easting: 313491 Northing: 261437
Ground level OD: 75.0m

Samples & in-situ tests			Result Peak (Residual)	Water	Strata details			
Depth taken	Type	No			O.D. Level	Legend	Depth	Description
0.5								No topsoil layer. Uppermost 0.2m is slightly has some frost cracks. 'C' horizon (SUBSOIL): very soft to stiff (alternating, layer to layer), massive (yet fissile owing to layering from 'lifts'), very dark brown (2/2, 10YR) slightly sandy SILT/CLAY with abundant gravels, cobbles and boulders. Subsoil is unmottled. Occasional pieces of concrete, with some wood, wire, cloth and branches also.
1.0								
1.5								
2.0								
2.35 2.5					72.65			**Trial pit completed at 2.35m on very dark brown, massive, stiff boulder clay 'fill'.**
3.0								
3.5								
4.0								
4.5								
5.0								

Plan



Bearing : 108° (N-S)

Stability :

Trial pit walls very consolidated, and material very competent.

General remarks :

Dug in northern portion of recently-filled eastern portion of the site, into an area of bare ground. Dug on a 1° slope, falling northwards.

Groundwater :

Dry.

Sequence summary:

Deep, 'filled' boulder clay, 'lifted' on-site. No topsoil.

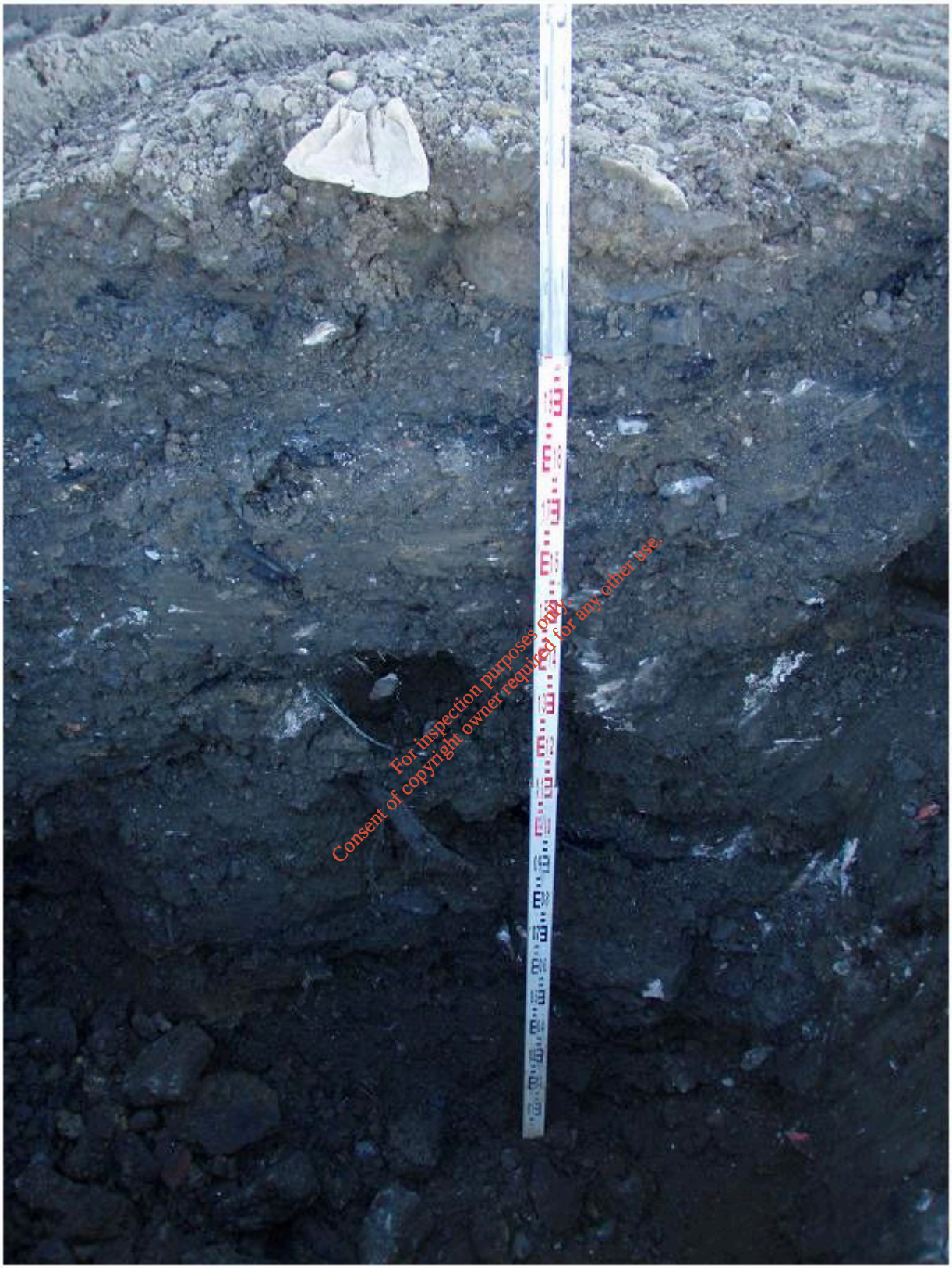


Plate A13: Profile of overconsolidated subsoil with alternating layers of very soft to stiff material in trial hole no. 13. Buried pieces of concrete, wire, branches and cloth also occur. No topsoil has been emplaced above this material as of yet either, and the ground is bare.

Robert Meehan
Consultant Geologist

PROFILE RECORD PF14

Project: Waste Licence Application at Naul

Site: Naul
Client: John Sheils Planning/Env. Ltd.
Project No.: 16/046

All dimensions on this sheet are in metres unless otherwise stated

Method and Equipment: Log of side profile from existing spoil area

Logged by: R. Meehan Date: 21/01/2009

Easting: 313418 Northing: 261332

Ground level OD (top): 75.5m

Samples & in-situ tests			Result Peak (Residual)	Water	Strata details			
Depth taken	Type	No			O.D. Level	Legend	Depth	Description
0.5								TOPSOIL 'A' horizon: **clods** of firm, massive, dark yellowish brown (4/4, 10YR) clay loam with occasional gravels and occasional roots and rootlets.
1.0								
1.5								
2.0								
2.0-2.2					73.3			
2.5								'C' horizon (SUBSOIL): firm to very stiff, massive (yet slightly fissile owing to layering from 'lifts'), very dark grey (3/1, 10YR) SILT/CLAY with common gravels and occasional cobbles and boulders.
3.0								
3.5								Subsoil is unmottled.
4.0								Some brown (4/3, 10YR) pods up to 0.4m across.
4.5								Occasional fragments of plastic pipe, but very rare.
5.0								**Section base at 5.0m on very dark grey, massive, very stiff boulder clay 'fill'.**

Plan

Face bearing : 10° (N-S)

Stability :

Material very consolidated and competent.

General remarks :

Dug in southeastern portion of the site, into the main face of imported fill around the existing pit area.

Groundwater :

Dry.

Sequence summary:

Well drained, deep, 'filled' topsoil over filled boulder clay, 'lifted' on-site.

Plate A14: Profile of recently-lain topsoil overlying overconsolidated subsoil at the side of the main eastern fill area. This material is very clean with only one small portion of waste material (plastic pipe) seen.

Robert Meehan
Consultant Geologist

PROFILE RECORD PF15

Project: Waste Licence Application at Naul

Site: Naul
Client: John Sheils Planning/Env. Ltd.
Project No.: 16/046

All dimensions on this sheet are in metres unless otherwise stated

Method and Equipment: Log of side profile from existing spoil area

Logged by: R. Meehan Date: 21/01/2009

Easting: 313397 Northing: 261395

Ground level OD (top): 75.0m

Samples & in-situ tests			Result Peak (Residual)	Water	Strata details			
Depth taken	Type	No			O.D. Level	Legend	Depth	Description
0.5					74.5			TOPSOIL 'A' horizon: firm, massive, dark yellowish brown (4/4, 10YR) clay loam with occasional gravels and occasional roots and rootlets.
1.0								
1.5								
2.0								'C' horizon (SUBSOIL): firm to very stiff, massive (yet slightly fissile owing to layering from 'lifts'), very dark greyish brown (3/2, 10YR) SILT/CLAY with common gravels and occasional cobbles and boulders.
2.5								Pockets of CLAY up to 0.8m deep and 2.5m long.
3.0								Subsoil is unmottled.
3.5								Some brown (4/3, 10YR) pods up to 2.1m across.
4.0								
4.5								
5.0								**Section base at 5.0m on very dark greyish brown, massive, very stiff boulder clay 'fill'.**

Plan

Face bearing : 170° (N-S)

Stability :

Material very consolidated and competent.

General remarks :

Dug in northeastern portion of the site, into the main face of imported fill around the existing pit area.

Groundwater :

Dry. Some surface water at base in main pit floor.

Sequence summary:

Well drained, deep, 'filled' topsoil over filled boulder clay, 'lifted' on-site.

Plate A15: Profile of relatively shallow, recently-lain topsoil overlying overconsolidated subsoil at the northern side of the main eastern fill area. This material is very clean also.

Robert Meehan
Consultant Geologist

PROFILE RECORD PF16

Project: Waste Licence Application at Naul

Site: Naul
Client: John Sheils Planning/Env. Ltd.
Project No.: 16/046

All dimensions on this sheet are in metres unless otherwise stated

Method and Equipment: Log of side profile from existing spoil area

Logged by: R. Meehan Date: 21/01/2009

Easting: 313517 Northing: 261447

Ground level OD (top): 72.5m

Samples & in-situ tests			Result Peak (Residual)	Water	Strata details			
Depth taken	Type	No			O.D. Level	Legend	Depth	Description
0.5								'C' horizon (SUBSOIL): firm to very stiff, massive (yet slightly fissile owing to layering from 'lifts'), very dark greyish brown (3/2, 10YR) SILT/CLAY with common gravels and occasional cobbles and boulders.
1.0								Subsoil is unmottled.
1.5					71.0			**Section base at 1.5m on very dark greyish brown, massive, very stiff boulder clay 'fill'.**
2.0								
2.5								
3.0								
3.5								
4.0								
4.5								
5.0								

Plan

Face bearing : 40° (SW-NE)

Stability :

Material very consolidated and competent.

General remarks :

Dug in eastern extreme of the site, into a low face at the edge of the southeastern circling trackway.

Groundwater :

Dry.

Sequence summary:

Well drained, deep, 'filled' boulder clay, 'lifted' on-site.

Plate A16: Profile of relatively shallow exposure into subsoil at the eastern extreme of the fill area. This material is also very clean.

Robert Meehan
Consultant Geologist

PROFILE RECORD PF17

Project: Waste Licence Application at Naul

Site: Naul
Client: John Sheils Planning/Env. Ltd.
Project No.: 16/046

All dimensions on this sheet are in metres unless otherwise stated

Method and Equipment: Log of side profile from existing spoil area

Logged by: R. Meehan Date: 21/01/2009

Easting: 313359 Northing: 261455

Ground level OD (top): 76.0m

Samples & in-situ tests			Result Peak (Residual)	Water	Strata details			
Depth taken	Type	No			O.D. Level	Legend	Depth	Description
0.5								'C' horizon (SUBSOIL): firm to very stiff, massive (yet slightly fissile owing to layering from 'lifts'), very dark greyish brown (3/2, 10YR) SILT/CLAY with common gravels and occasional cobbles and boulders.
1.0								
1.5								
2.0								
2.5								Cobbles and boulders increase with depth and the material becomes 'gravelly'.
3.0								Subsoil is unmottled.
3.5								
4.0								
4.5								
5.0					71.0			**Section base at 5.0m on very dark greyish brown, massive, very stiff boulder clay 'fill'.**

Plan

Face bearing : 80° (W-E)

Stability :

Material very consolidated and competent.

General remarks :

Dug in northeastern portion of the site, into the main face of imported fill around the northern edge of the existing pit area.

Groundwater :

Dry. Some surface water at base in main pit floor.

Sequence summary:

Well drained, deep, 'filled' boulder clay, 'lifted' on-site.

Plate A17: Profile of exposure into subsoil at the northeastern extreme of the main pit area. This material is clean, and gets more gravelly and 'bouldery' at the base.

Robert Meehan
Consultant Geologist

PROFILE RECORD PF18

Project: Waste Licence Application at Naul

Site: Naul
Client: John Sheils Planning/Env. Ltd.
Project No.: 16/046

All dimensions on this sheet are in metres unless otherwise stated

Method and Equipment: Log of side profile from existing spoil area

Logged by: R. Meehan Date: 21/01/2009

Easting: 313291 Northing: 261436

Ground level OD (top): 77.0m

Samples & in-situ tests			Result Peak (Residual)	Water	Strata details			
Depth taken	Type	No			O.D. Level	Legend	Depth	Description
0.5								'C' horizon (SUBSOIL): firm to very stiff, massive (yet slightly fissile owing to layering from 'lifts'), very dark greyish brown (3/2, 10YR) SILT/CLAY with common gravels and occasional cobbles and boulders.
1.0								
1.5								Cobbles and boulders increase with depth and the material becomes 'gravelly'.
2.0								
2.5								Subsoil is unmottled.
3.0								
3.5								
4.0								
4.5								
5.0					72.0			**Section base at 5.0m on very dark greyish brown, massive, very stiff boulder clay 'fill'.**

Plan

Face bearing : 80° (W-E)

Stability :

Material very consolidated and competent.

General remarks :

Dug in northwestern portion of the site, into the main face of imported fill around the northern edge of the existing pit area.

Groundwater :

Dry. Some surface water at base in main pit floor.

Sequence summary:

Well drained, deep, 'filled' boulder clay, 'lifted' on-site.

Plate A18: Profile of exposure into subsoil at the northwestern extreme of the main pit area. This material is clean, and again gets more gravelly and 'bouldery' at the base.

Appendix V: Original Soils Analysis Laboratory Reports

Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

Hydro-Environmental Services
22 Lower Main Street
Dungarvan
Co Waterford

4225

Attention :	Michael Gill
Date :	21st May, 2018
Your reference :	P1371-2
Our reference :	Test Report 18/6788 Batch 1
Location :	Clashford The Naul Dublin
Date samples received :	2nd May, 2018
Status :	Final report
Issue :	1

Thirteen samples were received for analysis on 2nd May, 2018 of which thirteen were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Where Waste Acceptance Criteria Suite (EC Decision of 19 December 2002 (2003/33/EC)) has been requested, all analyses have been performed using the relevant EN methods where they exist.

Compiled By:

Bruce Leslie
Project Co-ordinator

Client Name: Hydro-Environmental Services
Reference: P1371-2
Location: Clashford The Naul Dublin
Contact: Michael Gill
JE Job No.: 18/6788

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-3	4-10	11-13	14-18	19-21	22-24	25-27	28-30	31-34	35-37	LOD/LOR	Units	Method No.
Sample ID	TP18-09	TP18-11	TP18-04	TP18-06	TP18-05	TP18-02	TP18-18	TP18-12	TP18-16	TP18-13			
Depth	2.00-3.00	0.50-2.00	1.00-4.30	1.20-3.00	1.00-3.60	2.00-3.75	1.50-4.00	2.50-3.50	2.00-3.00	1.00-1.50			
COC No / misc													
Containers	V J T	V J	V J T	V J T	V J T	V J T	V J T	V J T	V J	V J T			
Sample Date	24/04/2018	23/04/2018	23/04/2018	23/04/2018	23/04/2018	23/04/2018	23/04/2018	24/04/2018	24/04/2018	24/04/2018			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	02/05/2018	02/05/2018	02/05/2018	02/05/2018	02/05/2018	02/05/2018	02/05/2018	02/05/2018	02/05/2018	02/05/2018			
Arsenic #	-	-	13.9	-	-	18.8	-	-	10.1	-	<0.5	mg/kg	TM30/PM15
Barium #	-	-	78	-	-	159	-	-	118	-	<1	mg/kg	TM30/PM15
Beryllium	-	-	0.9	-	-	1.4	-	-	1.1	-	<0.5	mg/kg	TM30/PM15
Cadmium #	-	-	1.6	-	-	2.0	-	-	1.6	-	<0.1	mg/kg	TM30/PM15
Chromium #	-	-	97.4	-	-	90.3	-	-	71.6	-	<0.5	mg/kg	TM30/PM15
Copper #	-	-	25	-	-	45	-	-	48	-	<1	mg/kg	TM30/PM15
Lead #	-	-	38	-	-	116	-	-	43	-	<5	mg/kg	TM30/PM15
Mercury #	-	-	0.1	-	-	<0.1	-	-	<0.1	-	<0.1	mg/kg	TM30/PM15
Nickel #	-	-	38.2	-	-	53.4	-	-	38.0	-	<0.7	mg/kg	TM30/PM15
Selenium #	-	-	<1	-	-	1	-	-	2	-	<1	mg/kg	TM30/PM15
Vanadium	-	-	44	-	-	45	-	-	59	-	<1	mg/kg	TM30/PM15
Water Soluble Boron #	-	-	0.6	-	-	1.0	-	-	1.1	-	<0.1	mg/kg	TM74/PM32
Zinc #	-	-	78	-	-	164	-	-	124	-	<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	0.15	<0.04	0.08	0.06	<0.04	<0.04	<0.04	<0.04	0.07	0.04	<0.04	mg/kg	TM4/PM8
Acenaphthylene	0.10	<0.03	<0.03	0.05	<0.03	<0.03	<0.03	0.05	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Acenaphthene #	0.07	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	TM4/PM8
Fluorene #	0.09	<0.04	<0.04	0.06	<0.04	<0.04	0.05	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Phenanthrene #	1.11	<0.03	0.24	0.66	0.09	0.23	0.23	0.58	0.21	0.23	<0.03	mg/kg	TM4/PM8
Anthracene #	0.25	<0.04	0.08	0.12	<0.04	0.06	0.09	0.09	<0.04	0.07	<0.04	mg/kg	TM4/PM8
Fluoranthene #	1.55	0.04	0.51	0.90	0.11	0.39	0.53	0.59	0.16	0.29	<0.03	mg/kg	TM4/PM8
Pyrene #	1.39	0.04	0.47	0.81	0.09	0.38	0.48	0.53	0.15	0.24	<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.74	<0.06	0.29	0.44	0.08	0.20	0.27	0.35	0.09	0.13	<0.06	mg/kg	TM4/PM8
Chrysene #	0.84	0.02	0.28	0.46	0.07	0.23	0.26	0.36	0.12	0.13	<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	1.39	<0.07	0.59	0.79	0.10	0.47	0.75	0.68	0.15	0.21	<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.70	<0.04	0.32	0.43	0.06	0.25	0.43	0.36	0.07	0.12	<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	0.39	<0.04	0.22	0.25	<0.04	0.16	0.31	0.23	<0.04	0.05	<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	0.14	<0.04	<0.04	0.08	<0.04	<0.04	0.06	0.06	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.48	<0.04	0.23	0.31	<0.04	0.18	0.35	0.26	0.06	0.08	<0.04	mg/kg	TM4/PM8
Coronene	0.10	<0.04	-	0.06	<0.04	-	0.07	0.05	-	<0.04	<0.04	mg/kg	TM4/PM8
PAH 6 Total #	4.51	<0.22	-	2.68	0.27	-	2.37	2.12	-	0.75	<0.22	mg/kg	TM4/PM8
PAH 16 Total	-	-	3.3	-	-	2.6	-	-	1.1	-	<0.6	mg/kg	TM4/PM8
PAH 17 Total	9.49	<0.64	-	5.45	<0.64	-	3.88	4.19	-	1.59	<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	1.00	<0.05	0.42	0.57	0.07	0.34	0.54	0.49	0.11	0.15	<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.39	<0.02	0.17	0.22	0.03	0.13	0.21	0.19	0.04	0.06	<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	107	108	105	106	107	104	106	106	109	107	<0	%	TM4/PM8
EPH (C8-C40) #	-	-	<30	-	-	396	-	-	153	-	<30	mg/kg	TM5/PM8
C8-C40 Mineral Oil (Calculation)	-	-	<30	-	-	<30	-	-	<30	-	<30	mg/kg	TM5/PM8
Mineral Oil >C8-C10	<5	<5	-	<5	<5	-	<5	<5	-	<5	<5	mg/kg	TM5/PM8/PM16
Mineral Oil >C10-C12	<10	<10	-	<10	<10	-	<10	<10	-	<10	<10	mg/kg	TM5/PM8/PM16
Mineral Oil >C12-C16	<10	<10	-	<10	<10	-	<10	<10	-	<10	<10	mg/kg	TM5/PM8/PM16
Mineral Oil >C16-C21	<10	<10	-	<10	<10	-	<10	<10	-	<10	<10	mg/kg	TM5/PM8/PM16

Please see attached notes for all abbreviations and acronyms

Client Name: Hydro-Environmental Services
Reference: P1371-2
Location: Clashford The Naul Dublin
Contact: Michael Gill
JE Job No.: 18/6788

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-3	4-10	11-13	14-18	19-21	22-24	25-27	28-30	31-34	35-37	LOD/LOR	Units	Method No.
Sample ID	TP18-09	TP18-11	TP18-04	TP18-06	TP18-05	TP18-02	TP18-18	TP18-12	TP18-16	TP18-13			
Depth	2.00-3.00	0.50-2.00	1.00-4.30	1.20-3.00	1.00-3.60	2.00-3.75	1.50-4.00	2.50-3.50	2.00-3.00	1.00-1.50			
COC No / misc													
Containers	V J T	V J	V J T	V J T	V J T	V J T	V J T	V J T	V J	V J T			
Sample Date	24/04/2018	23/04/2018	23/04/2018	23/04/2018	23/04/2018	23/04/2018	23/04/2018	24/04/2018	24/04/2018	24/04/2018			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	02/05/2018	02/05/2018	02/05/2018	02/05/2018	02/05/2018	02/05/2018	02/05/2018	02/05/2018	02/05/2018	02/05/2018			
Mineral Oil >C21-C40	28	<10	-	14	<10	-	14	18	-	55	<10	mg/kg	TM5/PM8/PM16
Mineral Oil >C8-C40	<45	<45	-	<45	<45	-	<45	<45	-	55	<45	mg/kg	TM5/PM8/PM16
MTBE #	<5	<5	-	<5	<5 SV	-	<5	<5 SV	-	<5 SV	<5	ug/kg	TM31/PM12
Benzene #	<5	<5	-	<5	<5 SV	-	<5	<5 SV	-	<5 SV	<5	ug/kg	TM31/PM12
Toluene #	<5	<5	-	<5	<5 SV	-	<5	<5 SV	-	<5 SV	<5	ug/kg	TM31/PM12
Ethylbenzene #	<5	<5	-	<5	<5 SV	-	<5	<5 SV	-	<5 SV	<5	ug/kg	TM31/PM12
m/p-Xylene #	<5	<5	-	<5	<5 SV	-	<5	<5 SV	-	<5 SV	<5	ug/kg	TM31/PM12
o-Xylene #	<5	<5	-	<5	<5 SV	-	<5	<5 SV	-	<5 SV	<5	ug/kg	TM31/PM12
PCB 28 #	<5	<5	-	<5	<5	-	<5	<5	-	10	<5	ug/kg	TM17/PM8
PCB 52 #	<5	<5	-	<5	<5	-	<5	<5	-	13	<5	ug/kg	TM17/PM8
PCB 101 #	<5	<5	-	<5	<5	-	11	<5	-	19	<5	ug/kg	TM17/PM8
PCB 118 #	<5	<5	-	<5	<5	-	<5	<5	-	12	<5	ug/kg	TM17/PM8
PCB 138 #	<5	<5	-	<5	<5	-	56	<5	-	10	<5	ug/kg	TM17/PM8
PCB 153 #	<5	<5	-	<5	<5	-	40	<5	-	6	<5	ug/kg	TM17/PM8
PCB 180 #	<5	<5	-	<5	<5	-	53	<5	-	<5	<5	ug/kg	TM17/PM8
Total 7 PCBs #	<35	<35	-	<35	<35	-	160	<35	-	70	<35	ug/kg	TM17/PM8
Phenol #	-	-	<0.01	-	-	<0.01	-	-	<0.01	-	<0.01	mg/kg	TM26/PM21
Natural Moisture Content	23.0	18.2	21.4	13.0	14.5	19.5	17.4	25.6	15.3	6.0	<0.1	%	PM4/PM0
% Dry Matter 105°C	81.1	84.1	-	85.3	83.3	-	84.2	83.6	-	82.3	<0.1	%	NONE/PM4
Hexavalent Chromium #	-	-	<0.3	-	-	<0.3	-	-	<0.3	-	<0.3	mg/kg	TM38/PM20
Chromium III	-	-	97.4	-	-	90.3	-	-	71.6	-	<0.5	mg/kg	NONE/NONE
Total Organic Carbon #	2.76	1.00	-	1.32	0.58	-	0.90	2.68	-	0.36	<0.02	%	TM21/PM24
Asbestos Type*	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD		None	Subcontracted
Mass of raw test portion	0.1105	0.1065	-	0.1052	0.1084	-	0.1069	0.1073	-	0.109		kg	NONE/PM17
Mass of dried test portion	0.09	0.09	-	0.09	0.09	-	0.09	0.09	-	0.09		kg	NONE/PM17

Please see attached notes for all abbreviations and acronyms

Client Name: Hydro-Environmental Services
Reference: P1371-2
Location: Clashford The Naul Dublin
Contact: Michael Gill
JE Job No.: 18/6788

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	38-40	41-43	44-46									
Sample ID	TP18-17	TP18-14	TP18-09									
Depth	0.50-2.00	1.80	0.50-2.00									
COC No / misc												
Containers	V J T	V J T	V J T									
Sample Date	24/04/2018	24/04/2018	24/04/2018									
Sample Type	Soil	Soil	Soil									
Batch Number	1	1	1									
Date of Receipt	02/05/2018	02/05/2018	02/05/2018									

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Arsenic #	18.6	16.9	-								<0.5	mg/kg	TM30/PM15
Barium #	120	133	-								<1	mg/kg	TM30/PM15
Beryllium	1.1	1.4	-								<0.5	mg/kg	TM30/PM15
Cadmium #	1.2	2.4	-								<0.1	mg/kg	TM30/PM15
Chromium #	76.0	73.8	-								<0.5	mg/kg	TM30/PM15
Copper #	35	46	-								<1	mg/kg	TM30/PM15
Lead #	35	53	-								<5	mg/kg	TM30/PM15
Mercury #	<0.1	<0.1	-								<0.1	mg/kg	TM30/PM15
Nickel #	41.9	49.9	-								<0.7	mg/kg	TM30/PM15
Selenium #	2	3	-								<1	mg/kg	TM30/PM15
Vanadium	50	42	-								<1	mg/kg	TM30/PM15
Water Soluble Boron #	0.6	1.1	-								<0.1	mg/kg	TM74/PM32
Zinc #	142	137	-								<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	0.12	0.06	0.44								<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	0.06	<0.03								<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	0.30								<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	0.30								<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.24	0.31	2.05								<0.03	mg/kg	TM4/PM8
Anthracene #	0.07	0.06	0.35								<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.24	0.40	1.68								<0.03	mg/kg	TM4/PM8
Pyrene #	0.21	0.59	1.45								<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.15	0.16	0.67								<0.06	mg/kg	TM4/PM8
Chrysene #	0.11	0.25	0.76								<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	0.18	0.46	1.12								<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.09	0.27	0.60								<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	<0.04	0.27	0.35								<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	0.08								<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.05	0.41	0.43								<0.04	mg/kg	TM4/PM8
Coronene	-	-	0.08								<0.04	mg/kg	TM4/PM8
PAH 6 Total #	-	-	4.18								<0.22	mg/kg	TM4/PM8
PAH 16 Total	1.5	3.3	-								<0.6	mg/kg	TM4/PM8
PAH 17 Total	-	-	10.66								<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.13	0.33	0.81								<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.05	0.13	0.31								<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	106	103	106								<0	%	TM4/PM8
EPH (C8-C40) #	151	<30	-								<30	mg/kg	TM5/PM8
C8-C40 Mineral Oil (Calculation)	<30	<30	-								<30	mg/kg	TM5/PM8
Mineral Oil >C8-C10	-	-	<5								<5	mg/kg	TM5/PM8/PM16
Mineral Oil >C10-C12	-	-	<10								<10	mg/kg	TM5/PM8/PM16
Mineral Oil >C12-C16	-	-	<10								<10	mg/kg	TM5/PM8/PM16
Mineral Oil >C16-C21	-	-	<10								<10	mg/kg	TM5/PM8/PM16

Client Name: Hydro-Environmental Services
Reference: P1371-2
Location: Clashford The Naul Dublin
Contact: Michael Gill
JE Job No.: 18/6788

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	38-40	41-43	44-46									
Sample ID	TP18-17	TP18-14	TP18-09									
Depth	0.50-2.00	1.80	0.50-2.00									
COC No / misc												
Containers	V J T	V J T	V J T									
Sample Date	24/04/2018	24/04/2018	24/04/2018									
Sample Type	Soil	Soil	Soil									
Batch Number	1	1	1									
Date of Receipt	02/05/2018	02/05/2018	02/05/2018									

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
Mineral Oil >C21-C40	-	-	<10								<10	mg/kg	TM5/PM8/PM16
Mineral Oil >C8-C40	-	-	<45								<45	mg/kg	TM5/PM8/PM16
MTBE #	-	-	<5 SV								<5	ug/kg	TM31/PM12
Benzene #	-	-	<5 SV								<5	ug/kg	TM31/PM12
Toluene #	-	-	<5 SV								<5	ug/kg	TM31/PM12
Ethylbenzene #	-	-	<5 SV								<5	ug/kg	TM31/PM12
m/p-Xylene #	-	-	<5 SV								<5	ug/kg	TM31/PM12
o-Xylene #	-	-	<5 SV								<5	ug/kg	TM31/PM12
PCB 28 #	-	-	<5								<5	ug/kg	TM17/PM8
PCB 52 #	-	-	<5								<5	ug/kg	TM17/PM8
PCB 101 #	-	-	<5								<5	ug/kg	TM17/PM8
PCB 118 #	-	-	<5								<5	ug/kg	TM17/PM8
PCB 138 #	-	-	<5								<5	ug/kg	TM17/PM8
PCB 153 #	-	-	<5								<5	ug/kg	TM17/PM8
PCB 180 #	-	-	<5								<5	ug/kg	TM17/PM8
Total 7 PCBs #	-	-	<35								<35	ug/kg	TM17/PM8
Phenol #	<0.01	<0.01	-								<0.01	mg/kg	TM26/PM21
Natural Moisture Content	9.5	17.6	18.1								<0.1	%	PM4/PM0
% Dry Matter 105°C	-	-	76.3								<0.1	%	NONE/PM4
Hexavalent Chromium #	<0.3	<0.3	-								<0.3	mg/kg	TM38/PM20
Chromium III	76.0	73.8	-								<0.5	mg/kg	NONE/NONE
Total Organic Carbon #	-	-	1.69								<0.02	%	TM21/PM24
Asbestos Type*	NAD	NAD	NAD									None	Subcontracted
Mass of raw test portion	-	-	0.1182									kg	NONE/PM17
Mass of dried test portion	-	-	0.09									kg	NONE/PM17

Client Name: Hydro-Environmental Services
Reference: P1371-2
Location: Clashford The Naul Dublin
Contact: Michael Gill
JE Job No.: 18/6788

Report : CEN 10:1 1 Batch

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-3	4-10	14-18	19-21	25-27	28-30	35-37	44-46			LOD/LOR	Units	Method No.
Sample ID	TP18-09	TP18-11	TP18-06	TP18-05	TP18-18	TP18-12	TP18-13	TP18-09					
Depth	2.00-3.00	0.50-2.00	1.20-3.00	1.00-3.60	1.50-4.00	2.50-3.50	1.00-1.50	0.50-2.00					
COC No / misc													
Containers	V J T	V J	V J T	V J T	V J T	V J T	V J T	V J T					
Sample Date	24/04/2018	23/04/2018	23/04/2018	23/04/2018	23/04/2018	24/04/2018	24/04/2018	24/04/2018					
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil					
Batch Number	1	1	1	1	1	1	1	1					
Date of Receipt	02/05/2018	02/05/2018	02/05/2018	02/05/2018	02/05/2018	02/05/2018	02/05/2018	02/05/2018					
Dissolved Antimony #	0.011	<0.002	<0.002	<0.002	<0.002	0.004	0.002	0.008			<0.002	mg/l	TM30/PM17
Dissolved Antimony (A10) #	0.11	<0.02	<0.02	<0.02	<0.02	0.04	0.02	0.08			<0.02	mg/kg	TM30/PM17
Dissolved Arsenic #	0.0061	<0.0025	0.0093	0.0040	0.0050	0.0099	0.0102	0.0077			<0.0025	mg/l	TM30/PM17
Dissolved Arsenic (A10) #	0.061	<0.025	0.093	0.040	0.050	0.099	0.102	0.077			<0.025	mg/kg	TM30/PM17
Dissolved Barium #	0.049	0.007	0.018	0.011	0.024	0.031	0.012	0.052			<0.003	mg/l	TM30/PM17
Dissolved Barium (A10) #	0.49	0.07	0.18	0.11	0.24	0.31	0.12	0.52			<0.03	mg/kg	TM30/PM17
Dissolved Cadmium #	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005			<0.0005	mg/l	TM30/PM17
Dissolved Cadmium (A10) #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005			<0.005	mg/kg	TM30/PM17
Dissolved Chromium #	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	0.0020	<0.0015			<0.0015	mg/l	TM30/PM17
Dissolved Chromium (A10) #	<0.015	<0.015	<0.015	<0.015	<0.015	<0.015	0.020	<0.015			<0.015	mg/kg	TM30/PM17
Dissolved Copper #	<0.007	<0.007	<0.007	<0.007	<0.007	0.013	<0.007	<0.007			<0.007	mg/l	TM30/PM17
Dissolved Copper (A10) #	<0.07	<0.07	<0.07	<0.07	<0.07	0.13	<0.07	<0.07			<0.07	mg/kg	TM30/PM17
Dissolved Lead #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005			<0.005	mg/l	TM30/PM17
Dissolved Lead (A10) #	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05			<0.05	mg/kg	TM30/PM17
Dissolved Molybdenum #	0.011	0.009	0.011	0.015	0.016	0.014	0.013	0.015			<0.002	mg/l	TM30/PM17
Dissolved Molybdenum (A10) #	0.11	0.09	0.11	0.15	0.16	0.14	0.13	0.15			<0.02	mg/kg	TM30/PM17
Dissolved Nickel #	0.002	<0.002	<0.002	<0.002	<0.002	0.003	<0.002	0.002			<0.002	mg/l	TM30/PM17
Dissolved Nickel (A10) #	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02			<0.02	mg/kg	TM30/PM17
Dissolved Selenium #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.009	<0.003			<0.003	mg/l	TM30/PM17
Dissolved Selenium (A10) #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.09	<0.03			<0.03	mg/kg	TM30/PM17
Dissolved Zinc #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003			<0.003	mg/l	TM30/PM17
Dissolved Zinc (A10) #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03			<0.03	mg/kg	TM30/PM17
Mercury Dissolved by CVAF #	0.00003	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	<0.00001	0.00001			<0.00001	mg/l	TM61/PM38
Mercury Dissolved by CVAF #	0.0003	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001			<0.0001	mg/kg	TM61/PM38
Phenol	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01			<0.01	mg/l	TM26/PM0
Phenol	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1			<0.1	mg/kg	TM26/PM0
Fluoride	28.2	0.7	0.3	0.4	0.5	<0.3	0.3	27.7			<0.3	mg/l	TM173/PM0
Fluoride	282	7	3	4	5	<3	3	277			<3	mg/kg	TM173/PM0
Sulphate as SO4 #	195.15	10.23	60.68	17.10	34.49	77.86	85.04	167.95			<0.05	mg/l	TM38/PM0
Sulphate as SO4 #	1951.2	102.3	607.1	171.0	344.9	778.3	850.8	1679.3			<0.5	mg/kg	TM38/PM0
Chloride #	11.9	1.0	4.9	1.7	0.9	2.8	0.5	9.8			<0.3	mg/l	TM38/PM0
Chloride #	119	10	49	17	9	28	5	98			<3	mg/kg	TM38/PM0
Dissolved Organic Carbon	5	5	5	3	5	11	3	3			<2	mg/l	TM60/PM0
Dissolved Organic Carbon	50	50	50	30	50	110	30	30			<20	mg/kg	TM60/PM0
Total Dissolved Solids #	521	143	163	128	178	251	215	460			<35	mg/l	TM20/PM0
Total Dissolved Solids #	5209	1430	1631	1280	1780	2509	2151	4599			<350	mg/kg	TM20/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: Hydro-Environmental Services
Reference: P1371-2
Location: Clashford The Naul Dublin
Contact: Michael Gill
JE Job No.: 18/6788

SVOC Report : **Solid**

J E Sample No.	11-13	22-24	31-34	38-40	41-43							
Sample ID	TP18-04	TP18-02	TP18-16	TP18-17	TP18-14							
Depth	1.00-4.30	2.00-3.75	2.00-3.00	0.50-2.00	1.80							
COC No / misc												
Containers	V J T	V J T	V J	V J T	V J T							
Sample Date	23/04/2018	23/04/2018	24/04/2018	24/04/2018	24/04/2018							
Sample Type	Soil	Soil	Soil	Soil	Soil							
Batch Number	1	1	1	1	1							
Date of Receipt	02/05/2018	02/05/2018	02/05/2018	02/05/2018	02/05/2018							

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
SVOC MS													
Phenols													
2-Chlorophenol #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
2-Methylphenol	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
2-Nitrophenol	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
2,4-Dichlorophenol #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
2,4-Dimethylphenol	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
2,4,5-Trichlorophenol	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
2,4,6-Trichlorophenol	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
4-Chloro-3-methylphenol	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
4-Methylphenol	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
4-Nitrophenol	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Pentachlorophenol	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Phenol #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
PAHs													
2-Chloronaphthalene #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
2-Methylnaphthalene #	<10	54	<10	67	<10						<10	ug/kg	TM16/PM8
Phthalates													
Bis(2-ethylhexyl) phthalate	<100	<100	<100	<100	<100						<100	ug/kg	TM16/PM8
Butylbenzyl phthalate	<100	<100	<100	<100	<100						<100	ug/kg	TM16/PM8
Di-n-butyl phthalate	<100	<100	<100	<100	<100						<100	ug/kg	TM16/PM8
Di-n-Octyl phthalate	<100	<100	<100	<100	<100						<100	ug/kg	TM16/PM8
Diethyl phthalate	<100	<100	<100	<100	<100						<100	ug/kg	TM16/PM8
Dimethyl phthalate #	<100	<100	<100	<100	<100						<100	ug/kg	TM16/PM8
Other SVOCs													
1,2-Dichlorobenzene	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
1,2,4-Trichlorobenzene #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
1,3-Dichlorobenzene	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
1,4-Dichlorobenzene	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
2-Nitroaniline	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
2,4-Dinitrotoluene	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
2,6-Dinitrotoluene	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
3-Nitroaniline	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
4-Bromophenylphenylether #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
4-Chloroaniline	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
4-Chlorophenylphenylether	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
4-Nitroaniline	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Azobenzene	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Bis(2-chloroethoxy)methane	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Bis(2-chloroethyl)ether	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Carbazole	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Dibenzofuran #	<10	48	<10	47	<10						<10	ug/kg	TM16/PM8
Hexachlorobenzene	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Hexachlorobutadiene #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Hexachlorocyclopentadiene	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Hexachloroethane	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Isophorone #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
N-nitrosodi-n-propylamine #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Nitrobenzene #	<10	<10	<10	<10	<10						<10	ug/kg	TM16/PM8
Surrogate Recovery 2-Fluorobiphenyl	110	117	126	119	122						<0	%	TM16/PM8
Surrogate Recovery p-Terphenyl-d14	113	123	126	115	121						<0	%	TM16/PM8

Client Name: Hydro-Environmental Services
Reference: P1371-2
Location: Clashford The Naul Dublin
Contact: Michael Gill
JE Job No.: 18/6788

VOC Report : **Solid**

J E Sample No.	11-13	22-24	31-34	38-40	41-43						LOD/LOR	Units	Method No.
Sample ID	TP18-04	TP18-02	TP18-16	TP18-17	TP18-14								
Depth	1.00-4.30	2.00-3.75	2.00-3.00	0.50-2.00	1.80								
COC No / misc													
Containers	V J T	V J T	V J	V J T	V J T								
Sample Date	23/04/2018	23/04/2018	24/04/2018	24/04/2018	24/04/2018								
Sample Type	Soil	Soil	Soil	Soil	Soil								
Batch Number	1	1	1	1	1								
Date of Receipt	02/05/2018	02/05/2018	02/05/2018	02/05/2018	02/05/2018								
VOC MS													
Dichlorodifluoromethane	<2	<2	<2	<20$_{AA}$	<2						<2	ug/kg	TM15/PM10
Methyl Tertiary Butyl Ether #	<2	<2	<2	<20$_{AA}$	<2						<2	ug/kg	TM15/PM10
Chloromethane #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
Vinyl Chloride	<2	<2	<2	<20$_{AA}$	<2						<2	ug/kg	TM15_A/PM10
Bromomethane	<1	<1	<1	<10$_{AA}$	<1						<1	ug/kg	TM15/PM10
Chloroethane #	<2	<2	<2	<20$_{AA}$	<2						<2	ug/kg	TM15/PM10
Trichlorofluoromethane #	<2	<2	<2	<20$_{AA}$	<2						<2	ug/kg	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<6	<6	<6	<60$_{AA}$	<6						<6	ug/kg	TM15/PM10
Dichloromethane (DCM) #	<30	<30	<30	<300$_{AA}$	<30						<30	ug/kg	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
1,1-Dichloroethane #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
2,2-Dichloropropane	<4	<4	<4	<40$_{AA}$	<4						<4	ug/kg	TM15/PM10
Bromochloromethane #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
Chloroform #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
1,1,1-Trichloroethane #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
1,1-Dichloropropene #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
Carbon tetrachloride #	<4	<4	<4	<40$_{AA}$	<4						<4	ug/kg	TM15/PM10
1,2-Dichloroethane #	<4	<4	<4	<40$_{AA}$	<4						<4	ug/kg	TM15/PM10
Benzene #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
Trichloroethene (TCE) #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
1,2-Dichloropropane #	<6	<6	<6	<60$_{AA}$	<6						<6	ug/kg	TM15/PM10
Dibromomethane #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
Bromodichloromethane #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
cis-1-3-Dichloropropene	<4	<4	<4	<40$_{AA}$	<4						<4	ug/kg	TM15/PM10
Toluene #	<3	6	14	56$_{AA}$	8						<3	ug/kg	TM15/PM10
trans-1-3-Dichloropropene	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
1,1,2-Trichloroethane #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
1,3-Dichloropropane #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
Dibromochloromethane #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
1,2-Dibromoethane #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
Chlorobenzene #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
1,1,1,2-Tetrachloroethane #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
Ethylbenzene #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
p/m-Xylene #	<5	<5	7	<50$_{AA}$	<5						<5	ug/kg	TM15/PM10
o-Xylene #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
Styrene	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15_A/PM10
Bromoform	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
Isopropylbenzene #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
1,1,2,2-Tetrachloroethane #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
Bromobenzene	<2	<2	<2	<20$_{AA}$	<2						<2	ug/kg	TM15/PM10
1,2,3-Trichloropropane #	<4	<4	<4	<40$_{AA}$	<4						<4	ug/kg	TM15/PM10
Propylbenzene #	<4	<4	<4	<40$_{AA}$	<4						<4	ug/kg	TM15/PM10
2-Chlorotoluene	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
4-Chlorotoluene	<3	<3	<3	<30$_{AA}$	<3						<3	ug/kg	TM15/PM10
tert-Butylbenzene #	<5	<5	<5	<50$_{AA}$	<5						<5	ug/kg	TM15/PM10
1,2,4-Trimethylbenzene #	<6	<6	8	<60$_{AA}$	<6						<6	ug/kg	TM15/PM10
sec-Butylbenzene #	<4	<4	<4	<40$_{AA}$	<4						<4	ug/kg	TM15/PM10
4-Isopropyltoluene #	<4	<4	22	<40$_{AA}$	<4						<4	ug/kg	TM15/PM10
1,3-Dichlorobenzene #	<4	<4	<4	<40$_{AA}$	<4						<4	ug/kg	TM15/PM10
1,4-Dichlorobenzene #	<4	<4	<4	<40$_{AA}$	<4						<4	ug/kg	TM15/PM10
n-Butylbenzene #	<4	<4	<4	<40$_{AA}$	<4						<4	ug/kg	TM15/PM10
1,2-Dichlorobenzene #	<4	<4	<4	<40$_{AA}$	<4						<4	ug/kg	TM15/PM10
1,2-Dibromo-3-chloropropane #	<4	<4	<4	<40$_{AA}$	<4						<4	ug/kg	TM15/PM10
1,2,4-Trichlorobenzene #	<7	<7	<7	<70$_{AA}$	<7						<7	ug/kg	TM15/PM10
Hexachlorobutadiene	<4	<4	<4	<40$_{AA}$	<4						<4	ug/kg	TM15/PM10
Naphthalene	<27	<27	47	<270$_{AA}$	<27						<27	ug/kg	TM15/PM10
1,2,3-Trichlorobenzene #	<7	<7	<7	<70$_{AA}$	<7						<7	ug/kg	TM15/PM10
Surrogate Recovery Toluene D8	99	93	87	100$_{AA}$	85						<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	77	77	62	88$_{AA}$	56						<0	%	TM15/PM10

Please see attached notes for all abbreviations and acronyms

Mass of sample taken (kg)	0.1105	Dry Matter Content Ratio (%) =	81.1
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.879
Particle Size <4mm =	>95%	Eluate Volume (l)	0.795

		Landfill Waste Acceptance Criteria Limits		
JEFL Job No	**18/6788**			
Sample No	**2**			
Client Sample No	**TP18-09**			
Depth/Other	**2.00-3.00**	**Inert**	**Stable Non-reactive**	**Hazardous**
Sample Date	**24/04/2018**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	2.76	3	5	6
Sum of BTEX (mg/kg)	<0.025	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	<45	500	-	-
PAH Sum of 6 (mg/kg)	4.51	-	-	-
PAH Sum of 17 (mg/kg)	9.49	100	-	-
Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	0.061	0.5	2	25
Barium	0.49	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	<0.07	2	50	100
Mercury	0.0003	0.01	0.2	2
Molybdenum	0.11	0.5	10	30
Nickel	<0.02	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	0.11	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	<0.03	4	50	200
Chloride	119	800	15000	25000
Fluoride	282	10	150	500
Sulphate as SO4	1951.2	1000	20000	50000
Total Dissolved Solids	5209	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	50	500	800	1000

Mass of sample taken (kg)	0.1065	Dry Matter Content Ratio (%) =	84.1
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.883
Particle Size <4mm =	>95%	Eluate Volume (l)	0.81

		Landfill Waste Acceptance Criteria Limits		
JEFL Job No	**18/6788**			
Sample No	**5**			
Client Sample No	**TP18-11**	**Inert**	**Stable Non-reactive**	**Hazardous**
Depth/Other	**0.50-2.00**			
Sample Date	**23/04/2018**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	1.00	3	5	6
Sum of BTEX (mg/kg)	-	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	<45	500	-	-
PAH Sum of 6 (mg/kg)	<0.22	-	-	-
PAH Sum of 17 (mg/kg)	<0.64	100	-	-
Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	<0.025	0.5	2	25
Barium	0.07	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	<0.07	2	50	100
Mercury	<0.0001	0.01	0.2	2
Molybdenum	0.09	0.5	10	30
Nickel	<0.02	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	<0.02	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	<0.03	4	50	200
Chloride	10	800	15000	25000
Fluoride	7	10	150	500
Sulphate as SO4	102.3	1000	20000	50000
Total Dissolved Solids	1430	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	50	500	800	1000

Mass of sample taken (kg)	0.1052	Dry Matter Content Ratio (%) =	85.3
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.885
Particle Size <4mm =	>95%	Eluate Volume (l)	0.75

		Landfill Waste Acceptance Criteria Limits		
JEFL Job No	**18/6788**			
Sample No	**15**			
Client Sample No	**TP18-06**			
Depth/Other	**1.20-3.00**	**Inert**	**Stable Non-reactive**	**Hazardous**
Sample Date	**23/04/2018**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	1.32	3	5	6
Sum of BTEX (mg/kg)	-	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	<45	500	-	-
PAH Sum of 6 (mg/kg)	2.68	-	-	-
PAH Sum of 17 (mg/kg)	5.45	100	-	-

Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	0.093	0.5	2	25
Barium	0.18	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	<0.07	2	50	100
Mercury	<0.0001	0.01	0.2	2
Molybdenum	0.11	0.5	10	30
Nickel	<0.02	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	<0.02	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	<0.03	4	50	200
Chloride	49	800	15000	25000
Fluoride	3	10	150	500
Sulphate as SO4	607.1	1000	20000	50000
Total Dissolved Solids	1631	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	50	500	800	1000

Mass of sample taken (kg)	0.1084	Dry Matter Content Ratio (%) =	83.3
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.882
Particle Size <4mm =	>95%	Eluate Volume (l)	0.8

JEFL Job No	**18/6788**	**Landfill Waste Acceptance Criteria Limits**		
Sample No	**20**			
Client Sample No	**TP18-05**	**Inert**	**Stable Non-reactive**	**Hazardous**
Depth/Other	**1.00-3.60**			
Sample Date	**23/04/2018**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	0.58	3	5	6
Sum of BTEX (mg/kg)	<0.025	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	<45	500	-	-
PAH Sum of 6 (mg/kg)	0.27	-	-	-
PAH Sum of 17 (mg/kg)	<0.64	100	-	-

Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	0.040	0.5	2	25
Barium	0.11	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	<0.07	2	50	100
Mercury	<0.0001	0.01	0.2	2
Molybdenum	0.15	0.5	10	30
Nickel	<0.02	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	<0.02	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	<0.03	4	50	200
Chloride	17	800	15000	25000
Fluoride	4	10	150	500
Sulphate as SO4	171.0	1000	20000	50000
Total Dissolved Solids	1280	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	30	500	800	1000

Mass of sample taken (kg)	0.1069	Dry Matter Content Ratio (%) =	84.2
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.883
Particle Size <4mm =	>95%	Eluate Volume (l)	0.78

JEFL Job No	**18/6788**	**Landfill Waste Acceptance Criteria Limits**		
Sample No	**26**			
Client Sample No	**TP18-18**	**Inert**	**Stable Non-reactive**	**Hazardous**
Depth/Other	**1.50-4.00**			
Sample Date	**23/04/2018**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	0.90	3	5	6
Sum of BTEX (mg/kg)	<0.025	6	-	-
Sum of 7 PCBs (mg/kg)	0.160	1	-	-
Mineral Oil (mg/kg)	<45	500	-	-
PAH Sum of 6 (mg/kg)	2.37	-	-	-
PAH Sum of 17 (mg/kg)	3.88	100	-	-

Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	0.050	0.5	2	25
Barium	0.24	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	<0.07	2	50	100
Mercury	<0.0001	0.01	0.2	2
Molybdenum	0.16	0.5	10	30
Nickel	<0.02	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	<0.02	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	<0.03	4	50	200
Chloride	9	800	15000	25000
Fluoride	5	10	150	500
Sulphate as SO4	344.9	1000	20000	50000
Total Dissolved Solids	1780	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	50	500	800	1000

Mass of sample taken (kg)	0.1073	Dry Matter Content Ratio (%) =	83.6
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.882
Particle Size <4mm =	>95%	Eluate Volume (l)	0.79

		Landfill Waste Acceptance Criteria Limits		
JEFL Job No	**18/6788**			
Sample No	**29**			
Client Sample No	**TP18-12**			
Depth/Other	**2.50-3.50**	**Inert**	**Stable Non-reactive**	**Hazardous**
Sample Date	**24/04/2018**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	2.68	3	5	6
Sum of BTEX (mg/kg)	<0.025	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	<45	500	-	-
PAH Sum of 6 (mg/kg)	2.12	-	-	-
PAH Sum of 17 (mg/kg)	4.19	100	-	-

Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	0.099	0.5	2	25
Barium	0.31	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	0.13	2	50	100
Mercury	<0.0001	0.01	0.2	2
Molybdenum	0.14	0.5	10	30
Nickel	0.03	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	0.04	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	<0.03	4	50	200
Chloride	28	800	15000	25000
Fluoride	<3	10	150	500
Sulphate as SO4	778.3	1000	20000	50000
Total Dissolved Solids	2509	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	110	500	800	1000

Mass of sample taken (kg)	0.109	Dry Matter Content Ratio (%) =	82.3
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.881
Particle Size <4mm =	>95%	Eluate Volume (l)	0.74

		Landfill Waste Acceptance Criteria Limits		
JEFL Job No	**18/6788**			
Sample No	**36**			
Client Sample No	**TP18-13**			
Depth/Other	**1.00-1.50**	**Inert**	**Stable Non-reactive**	**Hazardous**
Sample Date	**24/04/2018**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	0.36	3	5	6
Sum of BTEX (mg/kg)	<0.025	6	-	-
Sum of 7 PCBs (mg/kg)	0.070	1	-	-
Mineral Oil (mg/kg)	55	500	-	-
PAH Sum of 6 (mg/kg)	0.75	-	-	-
PAH Sum of 17 (mg/kg)	1.59	100	-	-

Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	0.102	0.5	2	25
Barium	0.12	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	0.020	0.5	10	70
Copper	<0.07	2	50	100
Mercury	<0.0001	0.01	0.2	2
Molybdenum	0.13	0.5	10	30
Nickel	<0.02	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	0.02	0.06	0.7	5
Selenium	0.09	0.1	0.5	7
Zinc	<0.03	4	50	200
Chloride	5	800	15000	25000
Fluoride	3	10	150	500
Sulphate as SO4	850.8	1000	20000	50000
Total Dissolved Solids	2151	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	30	500	800	1000

Mass of sample taken (kg)	0.1182	Dry Matter Content Ratio (%) =	76.3
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.872
Particle Size <4mm =	>95%	Eluate Volume (l)	0.8

JEFL Job No	**18/6788**	**Landfill Waste Acceptance Criteria Limits**		
Sample No	**45**			
Client Sample No	**TP18-09**	**Inert**	**Stable Non-reactive**	**Hazardous**
Depth/Other	**0.50-2.00**			
Sample Date	**24/04/2018**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	1.69	3	5	6
Sum of BTEX (mg/kg)	<0.025	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	<45	500	-	-
PAH Sum of 6 (mg/kg)	4.18	-	-	-
PAH Sum of 17 (mg/kg)	10.66	100	-	-

Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	0.077	0.5	2	25
Barium	0.52	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	<0.07	2	50	100
Mercury	<0.0001	0.01	0.2	2
Molybdenum	0.15	0.5	10	30
Nickel	<0.02	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	0.08	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	<0.03	4	50	200
Chloride	98	800	15000	25000
Fluoride	277	10	150	500
Sulphate as SO4	1679.3	1000	20000	50000
Total Dissolved Solids	4599	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	30	500	800	1000

Client Name: Hydro-Environmental Services

Reference: P1371-2

Location: Clashford The Naul Dublin

Contact: Michael Gill

Matrix : Solid

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
18/6788	1	TP18-09	2.00-3.00	1-3	GRO, PAH, PCB	Sample holding time exceeded
18/6788	1	TP18-11	0.50-2.00	4-10	GRO, PAH, PCB	Sample holding time exceeded
18/6788	1	TP18-04	1.00-4.30	11-13	EPH, PAH, Phenols, SVOC, VOC	Sample holding time exceeded
18/6788	1	TP18-06	1.20-3.00	14-18	GRO, PAH, PCB	Sample holding time exceeded
18/6788	1	TP18-05	1.00-3.60	19-21	GRO, PAH, PCB	Sample holding time exceeded
18/6788	1	TP18-02	2.00-3.75	22-24	EPH, PAH, Phenols, SVOC, VOC	Sample holding time exceeded
18/6788	1	TP18-18	1.50-4.00	25-27	GRO, PAH, PCB	Sample holding time exceeded
18/6788	1	TP18-12	2.50-3.50	28-30	GRO, PAH, PCB	Sample holding time exceeded
18/6788	1	TP18-16	2.00-3.00	31-34	EPH, PAH, Phenols, SVOC, VOC	Sample holding time exceeded
18/6788	1	TP18-13	1.00-1.50	35-37	GRO, PAH, PCB	Sample holding time exceeded
18/6788	1	TP18-17	0.50-2.00	38-40	EPH, PAH, Phenols, SVOC, VOC	Sample holding time exceeded
18/6788	1	TP18-14	1.80	41-43	EPH, PAH, Phenols, SVOC, VOC	Sample holding time exceeded
18/6788	1	TP18-09	0.50-2.00	44-46	GRO, PAH, PCB	Sample holding time exceeded

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 18/6788

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to an Exova Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x10 Dilution

JE Job No: 18/6788

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes

JE Job No: 18/6788

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid or water samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.	Yes		AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM17	Modified method EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.	Yes		AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes

JE Job No: 18/6788

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes		AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.			AR	Yes
TM61	Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence.	PM38	Samples are brominated to reduce all mercury compounds to Mercury (II) which is analysed using method TM061.	Yes		AR	Yes
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes		AD	Yes
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.			AR	Yes
NONE	No Method Code	NONE	No Method Code			AR	Yes
NONE	No Method Code	PM17	Modified method EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.				
NONE	No Method Code	PM17	Modified method EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.			AR	
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.			AR	

JE Job No: 18/6788

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
Subcontracted	See attached subcontractor report for accreditation status and provider.					AR	
TM15_A	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds, Vinyl Chloride & Styrene by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes

Appendix - Methods used for WAC (2003/33/EC)

Leachate tests	
10l/kg; 4mm	I.S. EN 12457-2:2002 Specified particle size; water added to L/S ratio; capped; agitated for 24 ± 0.5 hours; eluate settled and filtered over 0.45 µm membrane filter.
Eluate analysis	
As	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Ba	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cd	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cr total	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cu	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Hg	I.S. EN 13370 rec. EN 1483 (CVAAS)
Mo	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Ni	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Pb	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Sb	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Se	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Zn	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Chloride	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Fluoride	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Sulphate	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Phenol index	I.S. EN 13370 rec. ISO 6439 (4-Aminoantipyrine spectrometic methods after distillation)* (BY HPLC - Jones Env)
DOC	I.S. EN 1484
TDS	I.S. EN 15216
Compositional analysis	
TOC	I.S. EN 13137 Method B: carbonates removed with acid; TOC by combustion.
BTEX	GC-FID
PCB7**	I.S. EN 15308 analysis by GC-ECD.
Mineral oil	I.S. EN 14039 C10 to C40 analysis by GC-FID.
PAH17***	I.S. EN 15527 PAH17 analysis by GC-MS
Metals	I.S. EN 13657 - Aqua regia digestion: EN ISO 11885 (ICP-OES)
Other	
Dry matter	I.S. EN 14346 sample is dried to a constant mass in an oven at 105 ± 3 °C; Method B Water content by direct Karl-Fischer-titration and either volumetric or coulometric detection.
LOI	I.S. EN 15169 Difference in mass after heating in a furnace up to 550 ± 25 °C.
ANC	CEN/TS 15364 Determined by amouns of acid or base needed to cover the pH range

Notes:

*If not suitable due to LOD, precision, etc., any other suitable method can be used, e.g. AFS, ICP-MS

**PCB-28, PCB-52, PCB-101, PCB-118, PCB-138, PCB-153 and PCB-180

***Naphthalene, Acenaphthylene, Acenaphthene, Anthracene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)perylene, Benzo(a)pyrene, Chrysene, Coronene, Dibenzo(a,h)anthracene, Fluorene, Fluoranthene, Indeno(1,2,3-c,d)pyrene, Phenanthrene and Pyrene.

Exova Jones Environmental

Registered Address : Exova (UK) Ltd, Lochend Industrial Estate, Newbridge, Midlothian, EH28 8PL

Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

Tel: +44 (0) 1244 833780
Fax: +44 (0) 1244 833781

Hydro-Environmental Services
22 Lower Main Street
Dungarvan
Co Waterford

4225

Attention :	Michael Gill
Date :	18th June, 2018
Your reference :	P1317-2
Our reference :	Test Report 18/6842 Batch 1
Location :	Clashford The Naul Co Dublin
Date samples received :	3rd May, 2018
Status :	Final report
Issue :	2.1

Nine samples were received for analysis on 3rd May, 2018 of which nine were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Where Waste Acceptance Criteria Suite (EC Decision of 19 December 2002 (2003/33/EC)) has been requested, all analyses have been performed using the relevant EN methods where they exist.

Compiled By:

Lucas Halliwell
Project Co-ordinator

Client Name: Hydro-Environmental Services
Reference: P1317-2
Location: Clashford The Naul Co Dublin
Contact: Michael Gill
JE Job No.: 18/6842

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27		LOD/LOR	Units	Method No.
Sample ID	BH01	BH02	BH03-1	BH03-2	BH04-1	BH04-2	BH05-1	BH05-2	BH06				
Depth	6.5	4.5	2.5-4.5	8.2	0.5-1.0	8.5	0.5-3.5	5.9	3.5-4.5				
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T				
Sample Date	23/04/2018	23/04/2018	25/04/2018	25/04/2018	25/04/2018	25/04/2018	26/04/2018	26/04/2018	26/04/2018				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018				
Arsenic #	-	11.3	-	-	16.0	-	-	27.3	-		<0.5	mg/kg	TM30/PM15
Barium #	-	106	-	-	139	-	-	113	-		<1	mg/kg	TM30/PM15
Beryllium	-	0.8	-	-	1.3	-	-	2.1	-		<0.5	mg/kg	TM30/PM15
Cadmium #	-	2.1	-	-	1.9	-	-	2.9	-		<0.1	mg/kg	TM30/PM15
Chromium #	-	78.9	-	-	76.3	-	-	109.7	-		<0.5	mg/kg	TM30/PM15
Copper #	-	21	-	-	29	-	-	36	-		<1	mg/kg	TM30/PM15
Lead #	-	34	-	-	27	-	-	29	-		<5	mg/kg	TM30/PM15
Mercury #	-	<0.1	-	-	<0.1	-	-	<0.1	-		<0.1	mg/kg	TM30/PM15
Nickel #	-	28.8	-	-	58.9	-	-	101.3	-		<0.7	mg/kg	TM30/PM15
Selenium #	-	<1	-	-	<1	-	-	<1	-		<1	mg/kg	TM30/PM15
Vanadium	-	28	-	-	49	-	-	63	-		<1	mg/kg	TM30/PM15
Water Soluble Boron #	-	1.5	-	-	0.9	-	-	0.8	-		<0.1	mg/kg	TM74/PM32
Zinc #	-	230	-	-	101	-	-	190	-		<5	mg/kg	TM30/PM15
Arsenic	-	-	15.7	-	-	-	15.6	-	-		<0.5	mg/kg	TM30/PM62
Barium	-	-	80	-	-	-	67	-	-		<1	mg/kg	TM30/PM62
Beryllium	-	-	1.0	-	-	-	0.8	-	-		<0.5	mg/kg	TM30/PM62
Cadmium	-	-	1.4	-	-	-	0.7	-	-		<0.1	mg/kg	TM30/PM62
Chromium	-	-	24.7	-	-	-	41.0	-	-		<0.5	mg/kg	TM30/PM62
Copper	-	-	73	-	-	-	31	-	-		<1	mg/kg	TM30/PM62
Lead	-	-	65	-	-	-	37	-	-		<5	mg/kg	TM30/PM62
Mercury	-	-	0.1	-	-	-	<0.1	-	-		<0.1	mg/kg	TM30/PM62
Nickel	-	-	39.2	-	-	-	37.0	-	-		<0.7	mg/kg	TM30/PM62
Selenium	-	-	1	-	-	-	<1	-	-		<1	mg/kg	TM30/PM62
Vanadium	-	-	31	-	-	-	38	-	-		<1	mg/kg	TM30/PM62
Water Soluble Boron	-	-	1.6	-	-	-	0.3	-	-		<0.1	mg/kg	TM74/PM61
Zinc	-	-	147	-	-	-	89	-	-		<5	mg/kg	TM30/PM62

Please see attached notes for all abbreviations and acronyms

Client Name: Hydro-Environmental Services
Reference: P1317-2
Location: Clashford The Naul Co Dublin
Contact: Michael Gill
JE Job No.: 18/6842

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27		LOD/LOR	Units	Method No.
Sample ID	BH01	BH02	BH03-1	BH03-2	BH04-1	BH04-2	BH05-1	BH05-2	BH06				
Depth	6.5	4.5	2.5-4.5	8.2	0.5-1.0	8.5	0.5-3.5	5.9	3.5-4.5				
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T				
Sample Date	23/04/2018	23/04/2018	25/04/2018	25/04/2018	25/04/2018	25/04/2018	26/04/2018	26/04/2018	26/04/2018				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018				
PAH MS													
Naphthalene #	<0.04	0.07	0.06	<0.04	<0.04	<0.04	-	-	0.08		<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	0.03	0.05	<0.03	<0.03	<0.03	-	-	<0.03		<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	0.06	0.07	<0.05	<0.05	<0.05	-	-	<0.05		<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	0.06	0.11	<0.04	<0.04	<0.04	-	-	0.04		<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.06	0.56	0.60	0.29	0.05	0.20	-	-	0.38		<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	0.17	0.16	0.09	<0.04	<0.04	-	-	0.12		<0.04	mg/kg	TM4/PM8
Fluoranthene #	0.06	0.77	1.15	0.46	0.07	0.26	-	-	0.79		<0.03	mg/kg	TM4/PM8
Pyrene #	0.05	0.66	1.07	0.40	0.06	0.25	-	-	0.75		<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	0.37	0.71	0.27	<0.06	0.20	-	-	0.31		<0.06	mg/kg	TM4/PM8
Chrysene #	0.04	0.40	0.58	0.27	0.05	0.15	-	-	0.34		<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	0.62	1.06	0.40	<0.07	0.22	-	-	0.48		<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	0.33	0.56	0.21	<0.04	0.13	-	-	0.26		<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	<0.04	0.21	0.34	0.13	<0.04	0.07	-	-	0.12		<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	0.07	0.08	<0.04	<0.04	<0.04	-	-	<0.04		<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	0.24	0.38	0.15	<0.04	0.07	-	-	0.18		<0.04	mg/kg	TM4/PM8
Coronene	<0.04	0.06	0.08	<0.04	<0.04	<0.04	-	-	<0.04		<0.04	mg/kg	TM4/PM8
PAH 6 Total #	<0.22	-	-	1.35	-	0.75	-	-	1.83		<0.22	mg/kg	TM4/PM8
PAH 17 Total	<0.64	4.68	7.06	2.67	<0.64	1.55	-	-	3.85		<0.64	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	0.45	0.76	0.29	<0.05	0.16	-	-	0.35		<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	0.17	0.30	0.11	<0.02	0.06	-	-	0.13		<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	101	104	102	101	91	103	-	-	103		<0	%	TM4/PM8
EPH (C8-C40) #	-	271	276	-	115	-	823	161	-		<30	mg/kg	TM5/PM8
Mineral Oil >C8-C10	<5	-	-	<5	-	<5	-	-	<5		<5	mg/kg	TM5/PM8/PM16
Mineral Oil >C10-C12	<10	-	-	<10	-	<10	-	-	<10		<10	mg/kg	TM5/PM8/PM16
Mineral Oil >C12-C16	<10	-	-	<10	-	<10	-	-	<10		<10	mg/kg	TM5/PM8/PM16
Mineral Oil >C16-C21	<10	-	-	<10	-	<10	-	-	<10		<10	mg/kg	TM5/PM8/PM16
Mineral Oil >C21-C40	<10	-	-	<10	-	<10	-	-	<10		<10	mg/kg	TM5/PM8/PM16
Mineral Oil >C8-C40	<45	-	-	<45	-	<45	-	-	<45		<45	mg/kg	TM5/PM8/PM16
MTBE #	<5	-	-	<5	-	<5	-	-	<5 SV		<5	ug/kg	TM31/PM12
Benzene #	<5	-	-	<5	-	<5	-	-	<5 SV		<5	ug/kg	TM31/PM12
Toluene #	<5	-	-	<5	-	<5	-	-	<5 SV		<5	ug/kg	TM31/PM12
Ethylbenzene #	<5	-	-	<5	-	<5	-	-	<5 SV		<5	ug/kg	TM31/PM12
m/p-Xylene #	<5	-	-	<5	-	<5	-	-	<5 SV		<5	ug/kg	TM31/PM12
o-Xylene #	<5	-	-	<5	-	<5	-	-	<5 SV		<5	ug/kg	TM31/PM12
PCB 28 #	<5	-	-	<5	-	<5	-	-	<5		<5	ug/kg	TM17/PM8
PCB 52 #	<5	-	-	<5	-	<5	-	-	<5		<5	ug/kg	TM17/PM8
PCB 101 #	<5	-	-	<5	-	<5	-	-	<5		<5	ug/kg	TM17/PM8
PCB 118 #	<5	-	-	<5	-	<5	-	-	<5		<5	ug/kg	TM17/PM8
PCB 138 #	<5	-	-	<5	-	<5	-	-	<5		<5	ug/kg	TM17/PM8
PCB 153 #	<5	-	-	<5	-	<5	-	-	<5		<5	ug/kg	TM17/PM8

Client Name: Hydro-Environmental Services
Reference: P1317-2
Location: Clashford The Naul Co Dublin
Contact: Michael Gill
JE Job No.: 18/6842

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-21	22-24	25-27		LOD/LOR	Units	Method No.
Sample ID	BH01	BH02	BH03-1	BH03-2	BH04-1	BH04-2	BH05-1	BH05-2	BH06				
Depth	6.5	4.5	2.5-4.5	8.2	0.5-1.0	8.5	0.5-3.5	5.9	3.5-4.5				
COC No / misc													
Containers	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T	V J T				
Sample Date	23/04/2018	23/04/2018	25/04/2018	25/04/2018	25/04/2018	25/04/2018	26/04/2018	26/04/2018	26/04/2018				
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018	03/05/2018				
PCB 180 #	<5	-	-	<5	-	<5	-	-	<5		<5	ug/kg	TM17/PM8
Total 7 PCBs #	<35	-	-	<35	-	<35	-	-	<35		<35	ug/kg	TM17/PM8
Total Phenols HPLC	-	<0.15	<0.15	-	<0.15	-	-	-	-		<0.15	mg/kg	TM26/PM21
Natural Moisture Content	25.1	10.2	20.1	16.2	23.4	16.7	13.2	20.4	9.8		<0.1	%	PM4/PM0
% Dry Matter 105°C	82.4	-	-	79.8	-	82.7	-	-	88.7		<0.1	%	NONE/PM4
Hexavalent Chromium #	-	<0.3	<0.3	-	<0.3	-	<0.3	<0.3	-		<0.3	mg/kg	TM38/PM20
Chromium III	-	78.9	-	-	76.3	-	-	109.7	-		<0.5	mg/kg	NONE/NONE
Chromium III	-	-	24.7	-	-	-	41.0	-	-		<0.5	mg/kg	NONE/NONE
Total Organic Carbon #	1.02	-	-	1.01	-	0.76	-	-	0.83		<0.02	%	TM21/PM24
Mass of raw test portion	0.1097	-	-	0.1123	-	0.1091	-	-	0.1016			kg	NONE/PM17
Mass of dried test portion	0.09	-	-	0.09		0.09	-	-	0.09			kg	NONE/PM17

Please see attached notes for all abbreviations and acronyms

Client Name: Hydro-Environmental Services
Reference: P1317-2
Location: Clashford The Naul Co Dublin
Contact: Michael Gill
JE Job No.: 18/6842

Report : CEN 10:1 1 Batch

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-3	10-12	16-18	25-27							LOD/LOR	Units	Method No.
Sample ID	BH01	BH03-2	BH04-2	BH06									
Depth	6.5	8.2	8.5	3.5-4.5									
COC No / misc													
Containers	V J T	V J T	V J T	V J T									
Sample Date	23/04/2018	25/04/2018	25/04/2018	26/04/2018									
Sample Type	Soil	Soil	Soil	Soil									
Batch Number	1	1	1	1									
Date of Receipt	03/05/2018	03/05/2018	03/05/2018	03/05/2018									
Dissolved Antimony #	0.007	0.002	<0.002	0.006							<0.002	mg/l	TM30/PM17
Dissolved Antimony (A10) #	0.07	<0.02	<0.02	0.06							<0.02	mg/kg	TM30/PM17
Dissolved Arsenic #	0.0038	0.0099	<0.0025	0.0059							<0.0025	mg/l	TM30/PM17
Dissolved Arsenic (A10) #	0.038	0.099	<0.025	0.059							<0.025	mg/kg	TM30/PM17
Dissolved Barium #	0.029	0.007	0.061	0.010							<0.003	mg/l	TM30/PM17
Dissolved Barium (A10) #	0.29	0.07	0.61	0.10							<0.03	mg/kg	TM30/PM17
Dissolved Cadmium #	<0.0005	<0.0005	<0.0005	<0.0005							<0.0005	mg/l	TM30/PM17
Dissolved Cadmium (A10) #	<0.005	<0.005	<0.005	<0.005							<0.005	mg/kg	TM30/PM17
Dissolved Chromium #	<0.0015	<0.0015	<0.0015	<0.0015							<0.0015	mg/l	TM30/PM17
Dissolved Chromium (A10) #	<0.015	<0.015	<0.015	<0.015							<0.015	mg/kg	TM30/PM17
Dissolved Copper #	<0.007	0.011	<0.007	0.010							<0.007	mg/l	TM30/PM17
Dissolved Copper (A10) #	<0.07	0.11	<0.07	0.10							<0.07	mg/kg	TM30/PM17
Dissolved Lead #	<0.005	<0.005	<0.005	<0.005							<0.005	mg/l	TM30/PM17
Dissolved Lead (A10) #	<0.05	<0.05	<0.05	<0.05							<0.05	mg/kg	TM30/PM17
Dissolved Molybdenum #	0.026	0.032	0.018	0.016							<0.002	mg/l	TM30/PM17
Dissolved Molybdenum (A10) #	0.26	0.32	0.18	0.16							<0.02	mg/kg	TM30/PM17
Dissolved Nickel #	0.005	0.003	0.003	<0.002							<0.002	mg/l	TM30/PM17
Dissolved Nickel (A10) #	0.05	0.03	0.03	<0.02							<0.02	mg/kg	TM30/PM17
Dissolved Selenium #	<0.003	<0.003	<0.003	0.007							<0.003	mg/l	TM30/PM17
Dissolved Selenium (A10) #	<0.03	<0.03	<0.03	0.07							<0.03	mg/kg	TM30/PM17
Dissolved Zinc #	<0.003	<0.003	<0.003	<0.003							<0.003	mg/l	TM30/PM17
Dissolved Zinc (A10) #	<0.03	<0.03	<0.03	<0.03							<0.03	mg/kg	TM30/PM17
Mercury Dissolved by CVAF #	<0.00001	<0.00001	<0.00001	<0.00001							<0.00001	mg/l	TM61/PM38
Mercury Dissolved by CVAF #	<0.0001	<0.0001	<0.0001	<0.0001							<0.0001	mg/kg	TM61/PM38
Phenol	<0.01	<0.01	<0.01	<0.01							<0.01	mg/l	TM26/PM0
Phenol	<0.1	<0.1	<0.1	<0.1							<0.1	mg/kg	TM26/PM0
Fluoride	<0.3	0.6	<0.3	<0.3							<0.3	mg/l	TM173/PM0
Fluoride	<3	6	<3	<3							<3	mg/kg	TM173/PM0
Sulphate as SO4 #	54.22	59.60	316.85	103.81							<0.05	mg/l	TM38/PM0
Sulphate as SO4 #	542.4	595.9	3167.8	1038.6							<0.5	mg/kg	TM38/PM0
Chloride #	1.7	18.1	2.2	11.1							<0.3	mg/l	TM38/PM0
Chloride #	17	181	22	111							<3	mg/kg	TM38/PM0
Dissolved Organic Carbon	7	9	5	3							<2	mg/l	TM60/PM0
Dissolved Organic Carbon	70	90	50	30							<20	mg/kg	TM60/PM0
Total Dissolved Solids #	214	234	577	261							<35	mg/l	TM20/PM0
Total Dissolved Solids #	2141	2340	5769	2611							<350	mg/kg	TM20/PM0

Client Name: Hydro-Environmental Services
Reference: P1317-2
Location: Clashford The Naul Co Dublin
Contact: Michael Gill
JE Job No.: 18/6842

SVOC Report : **Solid**

J E Sample No.	4-6	7-9	13-15									
Sample ID	BH02	BH03-1	BH04-1									
Depth	4.5	2.5-4.5	0.5-1.0									
COC No / misc												
Containers	V J T	V J T	V J T									
Sample Date	23/04/2018	25/04/2018	25/04/2018									
Sample Type	Soil	Soil	Soil									
Batch Number	1	1	1									
Date of Receipt	03/05/2018	03/05/2018	03/05/2018									

Please see attached notes for all abbreviations and acronyms

				LOD/LOR	Units	Method No.
SVOC MS						
Phenols						
2-Chlorophenol #	<10	<10	<10	<10	ug/kg	TM16/PM8
2-Methylphenol	<10	<10	<10	<10	ug/kg	TM16/PM8
2-Nitrophenol	<10	<10	<10	<10	ug/kg	TM16/PM8
2,4-Dichlorophenol #	<10	<10	<10	<10	ug/kg	TM16/PM8
2,4-Dimethylphenol	<10	<10	<10	<10	ug/kg	TM16/PM8
2,4,5-Trichlorophenol	<10	<10	<10	<10	ug/kg	TM16/PM8
2,4,6-Trichlorophenol	<10	<10	<10	<10	ug/kg	TM16/PM8
4-Chloro-3-methylphenol	<10	<10	<10	<10	ug/kg	TM16/PM8
4-Methylphenol	<10	<10	<10	<10	ug/kg	TM16/PM8
4-Nitrophenol	<10	<10	<10	<10	ug/kg	TM16/PM8
Pentachlorophenol	<10	<10	<10	<10	ug/kg	TM16/PM8
Phenol #	<10	<10	<10	<10	ug/kg	TM16/PM8
PAHs						
2-Chloronaphthalene #	<10	<10	<10	<10	ug/kg	TM16/PM8
2-Methylnaphthalene #	74	94	<10	<10	ug/kg	TM16/PM8
Phthalates						
Bis(2-ethylhexyl) phthalate	<100	<100	<100	<100	ug/kg	TM16/PM8
Butylbenzyl phthalate	<100	<100	<100	<100	ug/kg	TM16/PM8
Di-n-butyl phthalate	<100	<100	<100	<100	ug/kg	TM16/PM8
Di-n-Octyl phthalate	<100	<100	<100	<100	ug/kg	TM16/PM8
Diethyl phthalate	<100	<100	<100	<100	ug/kg	TM16/PM8
Dimethyl phthalate #	<100	<100	<100	<100	ug/kg	TM16/PM8
Other SVOCs						
1,2-Dichlorobenzene	<10	<10	<10	<10	ug/kg	TM16/PM8
1,2,4-Trichlorobenzene #	<10	<10	<10	<10	ug/kg	TM16/PM8
1,3-Dichlorobenzene	<10	<10	<10	<10	ug/kg	TM16/PM8
1,4-Dichlorobenzene	<10	<10	<10	<10	ug/kg	TM16/PM8
2-Nitroaniline	<10	<10	<10	<10	ug/kg	TM16/PM8
2,4-Dinitrotoluene	<10	<10	<10	<10	ug/kg	TM16/PM8
2,6-Dinitrotoluene	<10	<10	<10	<10	ug/kg	TM16/PM8
3-Nitroaniline	<10	<10	<10	<10	ug/kg	TM16/PM8
4-Bromophenylphenylether #	<10	<10	<10	<10	ug/kg	TM16/PM8
4-Chloroaniline	<10	<10	<10	<10	ug/kg	TM16/PM8
4-Chlorophenylphenylether	<10	<10	<10	<10	ug/kg	TM16/PM8
4-Nitroaniline	<10	<10	<10	<10	ug/kg	TM16/PM8
Azobenzene	<10	<10	<10	<10	ug/kg	TM16/PM8
Bis(2-chloroethoxy)methane	<10	<10	<10	<10	ug/kg	TM16/PM8
Bis(2-chloroethyl)ether	<10	<10	<10	<10	ug/kg	TM16/PM8
Carbazole	<10	<10	<10	<10	ug/kg	TM16/PM8
Dibenzofuran #	<10	<10	<10	<10	ug/kg	TM16/PM8
Hexachlorobenzene	<10	<10	<10	<10	ug/kg	TM16/PM8
Hexachlorobutadiene #	<10	<10	<10	<10	ug/kg	TM16/PM8
Hexachlorocyclopentadiene	<10	<10	<10	<10	ug/kg	TM16/PM8
Hexachloroethane	<10	<10	<10	<10	ug/kg	TM16/PM8
Isophorone #	<10	<10	<10	<10	ug/kg	TM16/PM8
N-nitrosodi-n-propylamine #	<10	<10	<10	<10	ug/kg	TM16/PM8
Nitrobenzene #	<10	<10	<10	<10	ug/kg	TM16/PM8
Surrogate Recovery 2-Fluorobiphenyl	110	103	94	<0	%	TM16/PM8
Surrogate Recovery p-Terphenyl-d14	107	110	105	<0	%	TM16/PM8

Client Name: Hydro-Environmental Services
Reference: P1317-2
Location: Clashford The Naul Co Dublin
Contact: Michael Gill
JE Job No.: 18/6842

VOC Report : **Solid**

J E Sample No.	4-6	7-9	13-15									
Sample ID	BH02	BH03-1	BH04-1									
Depth	4.5	2.5-4.5	0.5-1.0									
COC No / misc												
Containers	V J T	V J T	V J T									
Sample Date	23/04/2018	25/04/2018	25/04/2018									
Sample Type	Soil	Soil	Soil									
Batch Number	1	1	1									
Date of Receipt	03/05/2018	03/05/2018	03/05/2018									

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
VOC MS													
Dichlorodifluoromethane	<2	<2	<2								<2	ug/kg	TM15/PM10
Methyl Tertiary Butyl Ether #	<2	<2	<2								<2	ug/kg	TM15/PM10
Chloromethane #	<3	<3	<3								<3	ug/kg	TM15/PM10
Vinyl Chloride	<2	<2	<2								<2	ug/kg	TM15_A/PM10
Bromomethane	<1	<1	<1								<1	ug/kg	TM15/PM10
Chloroethane #	<2	<2	<2								<2	ug/kg	TM15/PM10
Trichlorofluoromethane #	<2	<2	<2								<2	ug/kg	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<6	<6	<6								<6	ug/kg	TM15/PM10
Dichloromethane (DCM) #	<30	<30	<30								<30	ug/kg	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	<3								<3	ug/kg	TM15/PM10
1,1-Dichloroethane #	<3	<3	<3								<3	ug/kg	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	<3								<3	ug/kg	TM15/PM10
2,2-Dichloropropane	<4	<4	<4								<4	ug/kg	TM15/PM10
Bromochloromethane #	<3	<3	<3								<3	ug/kg	TM15/PM10
Chloroform #	<3	<3	<3								<3	ug/kg	TM15/PM10
1,1,1-Trichloroethane #	<3	<3	<3								<3	ug/kg	TM15/PM10
1,1-Dichloropropene #	<3	<3	<3								<3	ug/kg	TM15/PM10
Carbon tetrachloride #	<4	<4	<4								<4	ug/kg	TM15/PM10
1,2-Dichloroethane #	<4	<4	<4								<4	ug/kg	TM15/PM10
Benzene #	6	<3	<3								<3	ug/kg	TM15/PM10
Trichloroethene (TCE) #	<3	<3	<3								<3	ug/kg	TM15/PM10
1,2-Dichloropropane #	<6	<6	<6								<6	ug/kg	TM15/PM10
Dibromomethane #	<3	<3	<3								<3	ug/kg	TM15/PM10
Bromodichloromethane #	<3	<3	<3								<3	ug/kg	TM15/PM10
cis-1-3-Dichloropropene	<4	<4	<4								<4	ug/kg	TM15/PM10
Toluene #	8	38	<3								<3	ug/kg	TM15/PM10
trans-1-3-Dichloropropene	<3	<3	<3								<3	ug/kg	TM15/PM10
1,1,2-Trichloroethane #	<3	<3	<3								<3	ug/kg	TM15/PM10
Tetrachloroethene (PCE) #	<3	<3	<3								<3	ug/kg	TM15/PM10
1,3-Dichloropropane #	<3	<3	<3								<3	ug/kg	TM15/PM10
Dibromochloromethane #	<3	<3	<3								<3	ug/kg	TM15/PM10
1,2-Dibromoethane #	<3	<3	<3								<3	ug/kg	TM15/PM10
Chlorobenzene #	<3	<3	<3								<3	ug/kg	TM15/PM10
1,1,1,2-Tetrachloroethane #	<3	<3	<3								<3	ug/kg	TM15/PM10
Ethylbenzene #	<3	<3	<3								<3	ug/kg	TM15/PM10
p/m-Xylene #	6	<5	<5								<5	ug/kg	TM15/PM10
o-Xylene #	<3	<3	<3								<3	ug/kg	TM15/PM10
Styrene	<3	<3	<3								<3	ug/kg	TM15_A/PM10
Bromoform	<3	<3	<3								<3	ug/kg	TM15/PM10
Isopropylbenzene #	<3	<3	<3								<3	ug/kg	TM15/PM10
1,1,2,2-Tetrachloroethane #	<3	<3	<3								<3	ug/kg	TM15/PM10
Bromobenzene	<2	<2	<2								<2	ug/kg	TM15/PM10
1,2,3-Trichloropropane #	<4	<4	<4								<4	ug/kg	TM15/PM10
Propylbenzene #	<4	<4	<4								<4	ug/kg	TM15/PM10
2-Chlorotoluene	<3	<3	<3								<3	ug/kg	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	<3								<3	ug/kg	TM15/PM10
4-Chlorotoluene	<3	<3	<3								<3	ug/kg	TM15/PM10
tert-Butylbenzene #	<5	<5	<5								<5	ug/kg	TM15/PM10
1,2,4-Trimethylbenzene #	9	8	<6								<6	ug/kg	TM15/PM10
sec-Butylbenzene #	<4	<4	<4								<4	ug/kg	TM15/PM10
4-Isopropyltoluene #	<4	<4	<4								<4	ug/kg	TM15/PM10
1,3-Dichlorobenzene #	<4	<4	<4								<4	ug/kg	TM15/PM10
1,4-Dichlorobenzene #	<4	<4	<4								<4	ug/kg	TM15/PM10
n-Butylbenzene #	<4	<4	<4								<4	ug/kg	TM15/PM10
1,2-Dichlorobenzene #	<4	<4	<4								<4	ug/kg	TM15/PM10
1,2-Dibromo-3-chloropropane #	<4	<4	<4								<4	ug/kg	TM15/PM10
1,2,4-Trichlorobenzene #	<7	<7	<7								<7	ug/kg	TM15/PM10
Hexachlorobutadiene	<4	<4	<4								<4	ug/kg	TM15/PM10
Naphthalene	34	<27	<27								<27	ug/kg	TM15/PM10
1,2,3-Trichlorobenzene #	<7	<7	<7								<7	ug/kg	TM15/PM10
Surrogate Recovery Toluene D8	78	88	83								<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	55	62	61								<0	%	TM15/PM10

Mass of sample taken (kg)	0.1097	Dry Matter Content Ratio (%) =	82.4
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.881
Particle Size <4mm =	>95%	Eluate Volume (l)	0.71

JEFL Job No	**18/6842**	**Landfill Waste Acceptance Criteria Limits**		
Sample No	**3**			
Client Sample No	**BH01**	**Inert**	**Stable Non-reactive**	**Hazardous**
Depth/Other	**6.5**			
Sample Date	**23/04/2018**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	1.02	3	5	6
Sum of BTEX (mg/kg)	<0.025	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	<45	500	-	-
PAH Sum of 6 (mg/kg)	<0.22	-	-	-
PAH Sum of 17 (mg/kg)	<0.64	100	-	-

Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	0.038	0.5	2	25
Barium	0.29	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	<0.07	2	50	100
Mercury	<0.0001	0.01	0.2	2
Molybdenum	0.26	0.5	10	30
Nickel	0.05	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	0.07	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	<0.03	4	50	200
Chloride	17	800	15000	25000
Fluoride	<3	10	150	500
Sulphate as SO4	542.4	1000	20000	50000
Total Dissolved Solids	2141	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	70	500	800	1000

Mass of sample taken (kg)	0.1123	Dry Matter Content Ratio (%) =	79.8
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.877
Particle Size <4mm =	>95%	Eluate Volume (l)	0.7

JEFL Job No	**18/6842**	**Landfill Waste Acceptance Criteria Limits**		
Sample No	**12**			
Client Sample No	**BH03-2**	**Inert**	**Stable Non-reactive**	**Hazardous**
Depth/Other	**8.2**			
Sample Date	**25/04/2018**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	1.01	3	5	6
Sum of BTEX (mg/kg)	<0.025	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	<45	500	-	-
PAH Sum of 6 (mg/kg)	1.35	-	-	-
PAH Sum of 17 (mg/kg)	2.67	100	-	-

Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	0.099	0.5	2	25
Barium	0.07	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	0.11	2	50	100
Mercury	<0.0001	0.01	0.2	2
Molybdenum	0.32	0.5	10	30
Nickel	0.03	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	<0.02	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	<0.03	4	50	200
Chloride	181	800	15000	25000
Fluoride	6	10	150	500
Sulphate as SO4	595.9	1000	20000	50000
Total Dissolved Solids	2340	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	90	500	800	1000

Mass of sample taken (kg)	0.1091	Dry Matter Content Ratio (%) =	82.7
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.881
Particle Size <4mm =	>95%	Eluate Volume (l)	0.7

JEFL Job No	**18/6842**	**Landfill Waste Acceptance Criteria Limits**		
Sample No	**18**			
Client Sample No	**BH04-2**			
Depth/Other	**8.5**	**Inert**	**Stable Non-reactive**	**Hazardous**
Sample Date	**25/04/2018**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	0.76	3	5	6
Sum of BTEX (mg/kg)	<0.025	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	<45	500	-	-
PAH Sum of 6 (mg/kg)	0.75	-	-	-
PAH Sum of 17 (mg/kg)	1.55	100	-	-

Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	<0.025	0.5	2	25
Barium	0.61	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	<0.07	2	50	100
Mercury	<0.0001	0.01	0.2	2
Molybdenum	0.18	0.5	10	30
Nickel	0.03	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	<0.02	0.06	0.7	5
Selenium	<0.03	0.1	0.5	7
Zinc	<0.03	4	50	200
Chloride	22	800	15000	25000
Fluoride	<3	10	150	500
Sulphate as SO4	3167.8	1000	20000	50000
Total Dissolved Solids	5769	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	50	500	800	1000

Mass of sample taken (kg)	0.1016	Dry Matter Content Ratio (%) =	88.7
Mass of dry sample (kg) =	0.09	Leachant Volume (l)	0.889
Particle Size <4mm =	>95%	Eluate Volume (l)	0.69

JEFL Job No	**18/6842**	**Landfill Waste Acceptance Criteria Limits**		
Sample No	**27**			
Client Sample No	**BH06**			
Depth/Other	**3.5-4.5**	**Inert**	**Stable Non-reactive**	**Hazardous**
Sample Date	**26/04/2018**			
Batch No	**1**			
Solid Waste Analysis				
Total Organic Carbon (%)	0.83	3	5	6
Sum of BTEX (mg/kg)	<0.025	6	-	-
Sum of 7 PCBs (mg/kg)	<0.035	1	-	-
Mineral Oil (mg/kg)	<45	500	-	-
PAH Sum of 6 (mg/kg)	1.83	-	-	-
PAH Sum of 17 (mg/kg)	3.85	100	-	-

Eluate Analysis	**10:1 concn leached**	**Limit values for compliance leaching test using BS EN 12457-2 at L/S 10 l/kg**		
	A10			
	mg/kg	**mg/kg**		
Arsenic	0.059	0.5	2	25
Barium	0.10	20	100	300
Cadmium	<0.005	0.04	1	5
Chromium	<0.015	0.5	10	70
Copper	0.10	2	50	100
Mercury	<0.0001	0.01	0.2	2
Molybdenum	0.16	0.5	10	30
Nickel	<0.02	0.4	10	40
Lead	<0.05	0.5	10	50
Antimony	0.06	0.06	0.7	5
Selenium	0.07	0.1	0.5	7
Zinc	<0.03	4	50	200
Chloride	111	800	15000	25000
Fluoride	<3	10	150	500
Sulphate as SO4	1038.6	1000	20000	50000
Total Dissolved Solids	2611	4000	60000	100000
Phenol	<0.1	1	-	-
Dissolved Organic Carbon	30	500	800	1000

Client Name: Hydro-Environmental Services
Reference: P1317-2
Location: Clashford The Naul Co Dublin
Contact: Michael Gill

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions, including ACM type and Asbestos level, lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Jones Environmental Laboratory consultant, Jones Environmental Laboratory cannot be responsible for inaccurate or unrepresentative sampling.

Signed on behalf of Jones Environmental Laboratory:

Ryan Butterworth
Asbestos Team Leader

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Date Of Analysis	Analysis	Result
18/6842	1	BH03-1	2.5-4.5	9	16/05/2018	**General Description (Bulk Analysis)**	soil/stones
					16/05/2018	**Asbestos Fibres**	Fibre Bundles
					16/05/2018	**Asbestos ACM**	NAD
					16/05/2018	**Asbestos Type**	Chrysotile
					16/05/2018	**Asbestos Level Screen**	less than 0.1%
18/6842	1	BH04-1	0.5-1.0	15	16/05/2018	**General Description (Bulk Analysis)**	soil/stones
					16/05/2018	**Asbestos Fibres**	NAD
					16/05/2018	**Asbestos Fibres (2)**	NAD
					16/05/2018	**Asbestos ACM**	NAD
					16/05/2018	**Asbestos ACM (2)**	NAD
					16/05/2018	**Asbestos Type**	NAD
					16/05/2018	**Asbestos Type (2)**	NAD
					16/05/2018	**Asbestos Level Screen**	NAD
18/6842	1	BH05-1	0.5-3.5	21	16/05/2018	**General Description (Bulk Analysis)**	soil/stones
					16/05/2018	**Asbestos Fibres**	Fibre Bundles
					16/05/2018	**Asbestos ACM**	NAD
					16/05/2018	**Asbestos Type**	Chrysotile
					16/05/2018	**Asbestos Level Screen**	less than 0.1%
18/6842	1	BH05-2	5.9	24	16/05/2018	**General Description (Bulk Analysis)**	soil/stones
					16/05/2018	**Asbestos Fibres**	NAD
					16/05/2018	**Asbestos Fibres (2)**	NAD
					16/05/2018	**Asbestos ACM**	NAD
					16/05/2018	**Asbestos ACM (2)**	NAD
					16/05/2018	**Asbestos Type**	NAD
					16/05/2018	**Asbestos Type (2)**	NAD
					16/05/2018	**Asbestos Level Screen**	NAD

Client Name: Hydro-Environmental Services

Reference: P1317-2

Location: Clashford The Naul Co Dublin

Contact: Michael Gill

Matrix : Solid

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
18/6842	1	BH01	6.5	1-3	GRO	Solid Samples were received at a temperature above 9°C.
18/6842	1	BH01	6.5	1-3	GRO, PAH, PCB	Sample holding time exceeded
18/6842	1	BH02	4.5	4-6	EPH, PAH, SVOC, VOC	Sample holding time exceeded
18/6842	1	BH02	4.5	4-6	VOC	Solid Samples were received at a temperature above 9°C.
18/6842	1	BH03-1	2.5-4.5	7-9	EPH, PAH	Sample holding time exceeded
18/6842	1	BH03-1	2.5-4.5	7-9	VOC	Solid Samples were received at a temperature above 9°C.
18/6842	1	BH03-2	8.2	10-12	GRO	Solid Samples were received at a temperature above 9°C.
18/6842	1	BH03-2	8.2	10-12	GRO, PAH, PCB	Sample holding time exceeded
18/6842	1	BH04-1	0.5-1.0	13-15	EPH, PAH	Sample holding time exceeded
18/6842	1	BH04-1	0.5-1.0	13-15	VOC	Solid Samples were received at a temperature above 9°C.
18/6842	1	BH04-2	8.5	16-18	GRO	Solid Samples were received at a temperature above 9°C.
18/6842	1	BH04-2	8.5	16-18	GRO, PAH, PCB	Sample holding time exceeded
18/6842	1	BH06	3.5-4.5	25-27	GRO	Solid Samples were received at a temperature above 9°C.
18/6842	1	BH06	3.5-4.5	25-27	GRO, PAH, PCB	Sample holding time exceeded

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.

Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 18/6842

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to an Exova Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

JE Job No: 18/6842

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM8/PM16	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required/Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes

JE Job No: 18/6842

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM17	Modified US EPA method 8270. Determination of specific Polychlorinated Biphenyl congeners by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM20	Modified BS 1377-3: 1990/USEPA 160.3 Gravimetric determination of Total Dissolved Solids/Total Solids	PM0	No preparation is required.	Yes		AR	Yes
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM0	No preparation is required.			AR	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid or water samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.			AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.			AD	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes

JE Job No: 18/6842

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM17	Modified method EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.	Yes		AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	PM62	Acid digestion of as received solid samples using Aqua Regia refluxed at 112.5 °C.			AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM31	Modified USEPA 8015B. Determination of Methyltertbutylether, Benzene, Toluene, Ethylbenzene and Xylene by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM34	Turbidity by 2100P Turbidity Meter	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.				
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes		AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.	Yes			

JE Job No: 18/6842

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.			AR	Yes
TM61	Modified US EPA methods 245.7 and 200.7. Determination of Mercury by Cold Vapour Atomic Fluorescence.	PM38	Samples are brominated to reduce all mercury compounds to Mercury (II) which is analysed using method TM061.	Yes		AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM32	Hot water soluble boron is extracted from dried and ground samples using a 20:1 ratio.	Yes		AD	Yes
TM74	Analysis of water soluble boron (20:1 extract) by ICP-OES.	PM61	As received solid samples are extracted with hot water in a 20:1 ratio of water to soil ready for analysis by ICP.			AR	Yes
TM75	Modified US EPA method 310.1. Determination of Alkalinity by Metrohm automated titration analyser.	PM0	No preparation is required.	Yes			
TM76	Modified US EPA method 120.1. Determination of Specific Conductance by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM173	Analysis of fluoride by ISE (Ion Selective Electrode) using modified ISE method 340.2	PM0	No preparation is required.			AR	Yes
NONE	No Method Code	NONE	No Method Code			AR	Yes
NONE	No Method Code	PM17	Modified method EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.				

JE Job No: 18/6842

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
NONE	No Method Code	PM17	Modified method EN12457-2 As received solid samples are leached with water in a 10:1 water to soil ratio for 24 hours, the moisture content of the sample is included in the ratio.			AR	
NONE	No Method Code	PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.			AR	
TM15_A	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds, Vinyl Chloride & Styrene by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes

Appendix - Methods used for WAC (2003/33/EC)

Leachate tests	
10l/kg; 4mm	I.S. EN 12457-2:2002 Specified particle size; water added to L/S ratio; capped; agitated for 24 ± 0.5 hours; eluate settled and filtered over 0.45 µm membrane filter.
Eluate analysis	
As	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Ba	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cd	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cr total	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Cu	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Hg	I.S. EN 13370 rec. EN 1483 (CVAAS)
Mo	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Ni	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Pb	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Sb	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Se	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Zn	I.S. EN 12506 : EN ISO 11885 (ICP-OES)
Chloride	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Fluoride	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Sulphate	I.S. EN 12506 rec. EN ISO 10304-part 1 (liquid chromatography of ions)
Phenol index	I.S. EN 13370 rec. ISO 6439 (4-Aminoantipyrine spectrometic methods after distillation)* (BY HPLC - Jones Env)
DOC	I.S. EN 1484
TDS	I.S. EN 15216
Compositional analysis	
TOC	I.S. EN 13137 Method B: carbonates removed with acid; TOC by combustion.
BTEX	GC-FID
PCB7**	I.S. EN 15308 analysis by GC-ECD.
Mineral oil	I.S. EN 14039 C10 to C40 analysis by GC-FID.
PAH17***	I.S. EN 15527 PAH17 analysis by GC-MS
Metals	I.S. EN 13657 - Aqua regia digestion: EN ISO 11885 (ICP-OES)
Other	
Dry matter	I.S. EN 14346 sample is dried to a constant mass in an oven at 105 ± 3 °C; Method B Water content by direct Karl-Fischer-titration and either volumetric or coulometric detection.
LOI	I.S. EN 15169 Difference in mass after heating in a furnace up to 550 ± 25 °C.
ANC	CEN/TS 15364 Determined by amounts of acid or base needed to cover the pH range

Notes:

*If not suitable due to LOD, precision, etc., any other suitable method can be used, e.g. AFS, ICP-MS

**PCB-28, PCB-52, PCB-101, PCB-118, PCB-138, PCB-153 and PCB-180

***Naphthalene, Acenaphthylene, Acenaphthene, Anthracene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)perylene, Benzo(a)pyrene, Chrysene, Coronene, Dibenzo(a,h)anthracene, Fluorene, Fluoranthene, Indeno(1,2,3-c,d)pyrene, Phenanthrene and Pyrene.

5.4 CULTURAL HERITAGE

5.4.1 RMP SITES WITHIN THE STUDY AREA

RMP No.:	ME033-033
Townland:	Naul
Classification:	Mound
Description:	An oval mound, recorded as a barrow, measuring 15m in length north/south x 12m in width east/west x 2m in height.
RMP No.:	ME034-006
Townland:	Tullog
Classification:	Barrow – mound barrow
Description:	Circular mound (diam. 21m, H 3m).
RMP No.:	ME034-005
Townland:	Herbertstown
Classification:	Mound barrow
Description:	A circular mound measuring 21m in diameter x 1.8m in height.
RMP No.:	ME034-008
Townland:	Tullog
Classification:	Mill - unclassified
Description:	No records.
RMP No.:	ME034-009

Townland:	Naul
Classification:	Mill- unclassified
Description:	No further information is supplied on the RMP database.
RMP No.:	ME034-010
Townland:	Naul
Classification:	Castle- unclassified
Description:	Remains of "Whitecastle or Snowtown castle" incorporated into Naul Park House. Original castle thought to have been built by Richard Caddell in the 13th century. The Caddell family were evicted by Cromwell's General De Fyne in 1649. Naul Park House was built adjoining the east of the castle *c*. 1800. The entire house was demolished in the 1980s. Ground floor footings remain.
RMP No.:	ME034-011
Townland:	Naul
Classification:	Enclosure
Description:	Remains of enclosure identified on Longfield map (1825). In a field known locally as the "ringfield".
RMP No.:	ME034-012
Townland:	Naul
Classification:	Megalithic tomb- unclassified
Description:	Earthwork shown on Duncan's map (1821). Local tradition of a mound with a passage. Destroyed by a quarry activity *c*. 1980's.
RMP No.:	ME034-023
Townland:	Herbertstown

Classification:	Ring-ditch
Description:	A circular ring-ditch visible as a crop mark on an aerial photograph.
RMP No.:	ME034-026
Townland:	Tullog
Classification:	Ring-ditch
Description:	A circular ring-ditch visible as a crop mark on an aerial photograph.
RMP No.:	ME034-027
Townland:	Tullog
Classification:	Enclosure
Description:	A sub-circular enclosure visible as a crop mark as an aerial photograph.
RMP No.:	DU004-010003, DU004-045004 & 5
Townland:	Naul
Classification:	Church, cross, graveyard
Description:	The church is situated in an elevated position in a graveyard in Naul village. It is a plain rectangular building (internal dimensions 9.70m x 5.10m) orientated east north east/west south west. The north wall is missing. According to a wall plaque the church was built in 1710, but it retains earlier features indicating the re-use of a Medieval building. The Civil survey (1654-6) described the Medieval parish church in Naul as ruinous with only "*the walles of ye parish church*". The interior is lit by a double-light ogee-headed window with transom in the east wall and a plain double-light window in the south wall. It is entered through a pointed-arched west doorway with cable-moulding and pocked dressing. A cross (RMP DU004-010002) is located in the interior of the church. It is recorded as being monumental in nature and probably commemorative in function, and possibly dates to the 19th century.

	The church is surrounded by a walled graveyard which is square in plan and measures 34m in diameter (RMP DU004-045005). The interior is raised above the surrounding ground level and falls away to the north. The oldest graveslabs are in the west and south and are 18th and 19th century in date.
RMP No.:	DU004-041
Townland:	Reynoldstown
Classification:	Mill - unclassified
Description:	A marshy enclosed area S of the road east of 'Old Mill Bridge' over the Delvin river. The mill associated with this mill pond is in Tullog, County Meath (ME034-008----). These lands were part of the monastic estate of St Mary's Abbey.
RMP No.:	DU004-042
Townland:	Westown
Classification:	18th/19th century house
Description:	Shown on Rocque's map of 1760. Attached to the north side of a public house in Naul village. This is a two-storey stone-building with a gabled and slated roof. The latter was reconstructed and its gables raised to give a Dutch Billy effect in the 1940s. The chimney projects mid-way along the north side of building. This building probably dates from the post-1700 period
RMP No.:	DU004-043001 & 2
Townland:	Westown
Classification:	Castle – Tower House and Building
Description:	Westown House is an 18th-century mansion which incorporates the ground floor of a possible hall. In 1993 the mansion and rear courtyard containing finely built outbuildings were still in relatively good condition. The rear of the mansion and the outbuildings have since been demolished.

	Accessed by long grass tree-lined avenue leading westwards from Naul village. House facing north, three bay over basement. The main ground floor chamber has a broad, round arch opening in the south-east corner where an entrance down into a passageway is located, the roof of which contains brickwork and is secured with wooden joists.
RMP No.:	DU004-045001
Townland:	Westown
Classification:	Water mill - unclassified
Description:	The Civil survey (1654-6) mentions a cornmill at Westown. This was replaced by a flour mill erected by Arthur Mervyn between 1718 and 1722. The Old Mill ceased operations sometime between 1869 and 1906 and was roofless by 1934, when Oliver St. John Gogarty pondered the 'ruined .... roofless mill' in a poem he entitled The Mill at Naul.
RMP No.:	DU004-045002
Townland:	Naul
Classification:	Castle – Tower House
Description:	Located on the E edge of a ravine on the S bank of the River Delvin. The remains comprise the N end of an oblong three storey tower house. The southern end of the building, containing the staircase, collapsed in the 1960s. Built of coursed limestone masonry. There are remains of a double barrel-vault over ground floor. The second and third floors were originally of timber. There is a featureless doorway in W wall and a single-light ope with a splayed embrasure in the E wall on ground floor. Putlog holes are visible in the S and E walls. Traces of possible bawn wall project from the NE corner.
RMP No.:	DU004-045003
Townland:	Naul
Classification:	Ritual site- holy well

Description:	A spring well is located at the bottom of a ravine, south east of the River Delvin. It is approached from an overgrown pathway. The site is poorly preserved and is no longer venerated.
RMP No.:	DU004-045008
Townland:	Westown
Classification:	Bridge
Description:	The Down Survey (1655-6) map shows 'Naul Bridge' on the main route to the N from Swords through Rathbeale via Roganstown, the Naul and Dardistown to Drogheda. At present the river Delvin is crossed by a double-arched bridge which occupies the site of the earlier bridge. This has round segmental arches and dressing on the stonework.
RMP No.:	DU004-045009
Townland:	Naul
Classification:	Enclosure
Description:	A possible curving enclosure ditch was identified by a geophysical survey, which corresponds to a possible ditch and bank identified as low earthworks. The ditch may represent an enclosing feature associated with the adjacent tower-house. A cluster of within the enclosing ditch may also indicate archaeological activity although no clear archaeological patterns are visible.
RMP No.:	DU004-047
Townland:	Reynoldstown
Classification:	Church
Description:	There is a tradition of a chapel bank east of the stream. The Down Survey map and terrier indicate this area was the Glebe land of St Mary's Abbey. Located to the north end of a pasture field east of river with a steep fall to river.

RMP No.:	DU004-061
Townland:	Naul
Classification:	Enclosure
Description:	A circular enclosure visible as a crop mark on an aerial photograph.

5.4.2 IMPACT ASSESSMENT AND THE ARCHAEOLOGICAL RESOURCE

5.4.2.1 Potential Impacts on Archaeological Remains

Impacts can be identified from detailed information about a project, the nature of the area affected and the range of archaeological resources potentially affected. Development sites can affect the archaeological resource of a given landscape in a number of ways.

- Permanent and temporary land-take, associated structures, landscape mounding, and their construction may result in damage to or loss of archaeological remains and deposits, or physical loss to the setting of historic monuments and to the physical coherence of the landscape;
- Archaeological sites can be affected adversely in a number of ways: disturbance by excavation, topsoil stripping and the passage of heavy machinery; disturbance by vehicles working in unsuitable conditions; or burial of sites, limiting accessibility for future archaeological investigation;
- Hydrological changes in groundwater or surface water levels can result from construction activities such as de-watering and spoil disposal, or longer-term changes in drainage patterns. These may desiccate archaeological remains and associated deposits;
- Visual impacts on the historic landscape sometimes arise from construction traffic and facilities, built earthworks and structures, landscape mounding and planting, noise, fences and associated works. These features can impinge directly on historic monuments and historic landscape elements as well as their visual amenity value;
- Landscape measures such as tree planting can damage sub-surface archaeological features, due to topsoil stripping and through the root action of trees and shrubs as they grow;
- Ground consolidation by construction activities or the weight of permanent embankments can cause damage to buried archaeological remains, especially in colluvium or peat deposits;

- Disruption due to construction also offers in general the potential for adversely affecting archaeological remains. This can include machinery, site offices, service trenches, etc.;
- Although not widely appreciated, positive impacts can accrue from permitted developments. These can include positive resource management policies, improved maintenance and access to archaeological monuments and the increased level of knowledge of a site or historic landscape as a result of archaeological assessment and fieldwork.

5.4.2.2 Predicted Impacts

There is no standard scale against which the severity of impacts on the archaeological and historic landscape may be judged. The severity of a given level of land-take or visual intrusion varies with the type of monument, site or landscape feature and its existing environment. Severity of impact can be judged taking the following into account:

- The proportion of the feature affected and how far physical characteristics fundamental to the understanding of the feature would be lost;
- Consideration of the type, date, survival/condition, fragility/vulnerability, rarity, potential and amenity value of the feature affected;
- Assessment of the levels of noise, visual and hydrological impacts, either in general or site specific terms, as may be provided by other specialists.

Impacts are defined as:

> *"the degree of change in an environment resulting from a development"* (Environmental Protection Agency 2002, 30).

Impacts are described as imperceptible, not significant, slight, moderate, significant, very significant or profound on archaeological, architectural and cultural heritage remains (Details with respect to Significance Criteria are provided in Appendix 5.2).

5.4.3 MITIGATION MEASURES AND THE ARCHAEOLOGICAL RESOURCE

Mitigation is defined as features of the design or other measures of the proposed development that can be adopted to avoid, prevent, reduce or offset negative impacts.

The best opportunities for avoiding damage to archaeological remains or intrusion on their setting and amenity arise when the site options for the development are being considered. Damage to the archaeological resource immediately adjacent to developments may be prevented by the selection of appropriate construction methods. Reducing adverse impacts can be achieved by good design, for example by screening historic buildings or upstanding archaeological monuments or by burying archaeological sites undisturbed rather than destroying them. Offsetting adverse impacts is probably best illustrated by the full investigation and recording of archaeological sites that cannot be preserved *in situ*.

5.4.3.1 Definition of Mitigation Strategies

The ideal mitigation for all archaeological sites is preservation *in situ*. This however is not always a practical solution, and a series of recommendations are therefore offered to provide ameliorative measures where avoidance and preservation *in situ* are not possible.

Archaeological excavation involves the scientific removal and recording of all archaeological features, deposits and objects to the level of geological strata or the base level of a given development. Full archaeological excavation is recommended where initial investigation has uncovered evidence of archaeologically significant material and where avoidance of the site is not possible.

Archaeological test trenching is defined as:

> *"that form of excavation where the purpose is to establish the nature and extent of archaeological deposits and features present in a location which it is proposed to develop (though not normally to fully investigate those deposits or features) and allow an assessment to be made of the archaeological impact of the proposed development"* (Department of Arts, Heritage, Gaeltacht and the Islands 1999, 27).

Archaeological monitoring:

> *"involves an archaeologist being present in the course of the carrying out of development works (which may include conservation works), so as to identify and protect archaeological deposits, features or objects which may be uncovered or otherwise affected by the works"* (Department of Arts, Heritage, Gaeltacht and the Islands 1999, 28).